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(71) Applicant : CANON INC

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(72) Inventor : OGUSHI NOBUAKI

OGURA MASAYA

YONEYAMA YOSHITO

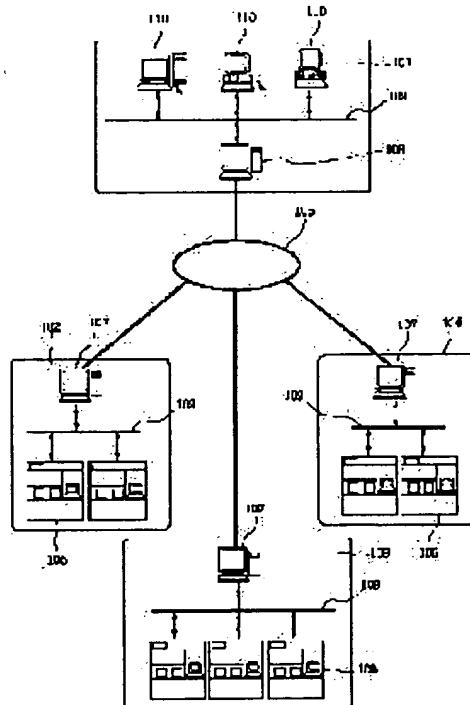
OTA HIROHISA

## (54) REMOTE MAINTENANCE SYSTEM FOR INDUSTRIAL EQUIPMENT

### (57) Abstract:

PROBLEM TO BE SOLVED: To provide a remote maintenance system which can quickly and surely maintain even an industrial equipment of a remote place.

SOLUTION: A monitoring host computer 107 is installed at each of plants 102 to 104 to monitor an industrial equipment 109 respectively. The computer 107 is connected to a management host computer 108 placed at a vendor 101 via an internet 105. Then the computer 107 of each plant detects the trouble of an industrial equipment 106 and notifies the vendor 101 of the status information showing the condition of the trouble. In response to this notification, the computer 108 of the vendor 101 notifies each plant of the answer information showing the treatment against the trouble condition.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The control maintenance system characterized by having a monitor means to be the control maintenance system which maintains the industrial device of a remote place, and to supervise the working state of 1 or two or more industrial devices, and the management tool which manages maintenance of an industrial device while communicating the information about maintenance of an industrial device between said monitor means through the Internet.

[Claim 2] In a control maintenance system according to claim 1, said management tool carries out the centralized control of the maintenance of each industrial device installed in two or more works.

[Claim 3] In a control maintenance system according to claim 2, it is that two or more works are the same or a user's different two or more works, and a vendor side is equipped with said management tool.

[Claim 4] In the control maintenance system according to claim 1, two or more kinds of industrial devices are installed in 1 works, and it has two or more said management tools respectively corresponding to each industrial device.

[Claim 5] In a control maintenance system according to claim 4, two or more industrial devices are devices which a different vendor supplies, and a different vendor side is equipped with said management tool, respectively.

[Claim 6] In a control maintenance system according to claim 1, it has a means to supply the software of an industrial device, or the guide information on device actuation to an industrial device through the Internet from said management tool.

[Claim 7] In a control maintenance system according to claim 1, said monitor means detects generating of the trouble of an industrial device, the status information which specifies the symptom of the trouble is notified to said management tool, and said management tool determines the coping-with method for the trouble of the industrial device concerned based on the status information, and notifies the response indication based on the determined coping-with method to said monitor means.

[Claim 8] In a control maintenance system according to claim 7, said monitor means has a maintenance means to maintain an industrial device based on the response indication notified from said management tool.

[Claim 9] In a control maintenance system according to claim 7, said management tool has the database which registers the information about maintenance of said industrial device, the information which identifies an industrial device, the symptom of the trouble which may be generated by the industrial device, and the coping-with method for the trouble relate, it registers with this database, and said management tool determines the coping-with method for the corresponding trouble as it with reference to said database.

[Claim 10] In a control maintenance system according to claim 9, whenever said management tool exchanges the information about maintenance of an industrial device between said monitor means, it has a renewal means of automatic to update said database based on the contents.

[Claim 11] In a control maintenance system according to claim 10, said management tool has further a renewal means of hand control to update said database based on the input from an operator.

[Claim 12] In a control maintenance system according to claim 9, it has further an access-permission means to permit the user of an industrial device accessing said management tool to said database.

[Claim 13] In a control maintenance system according to claim 12, said management tool has further a communication link security means to forbid access to said database, to persons other than the user of said industrial device.

[Claim 14] In a control maintenance system according to claim 9, said monitor means has an access means to access said database which said management tool has.

[Claim 15] In a control maintenance system according to claim 1, industrial devices are semiconductor fabrication machines and equipment.

[Claim 16] How to produce a semiconductor device using the semiconductor fabrication machines and equipment managed based on a control maintenance system according to claim 1.

[Claim 17] The semiconductor device produced using the semiconductor fabrication machines and equipment managed based on a control maintenance system according to claim 1.

[Claim 18] Since the control maintenance system which maintains the industrial device of a remote place is constituted An acquisition means to acquire the status information which is supervisory equipment formed in an industrial device side, detects generating of the trouble of 1 or two or more industrial devices, and shows the symptom of the trouble, While notifying the status information acquired with said acquisition means through the Internet to the management equipment which carries out the centralized control of the maintenance of an industrial device Supervisory equipment of the control maintenance system characterized by having the means of communications which receives the response indication which answers the notice and is sent through the Internet from said management equipment.

[Claim 19] In supervisory equipment according to claim 18, it has further a maintenance means to maintain an industrial device, based on the response indication received from said management equipment by said means of communications.

[Claim 20] In a control maintenance system according to claim 18, industrial devices are semiconductor fabrication machines and equipment.

[Claim 21] Since the control maintenance system which maintains the industrial device of a remote place is constituted The means of communications which communicates through each monitor means and the Internet of 1 or two or more works in which it is management equipment formed in a vendor side, and the supervisory equipment which supervises the working state of 1 or two or more industrial devices was installed, It is based on the status information about the symptom of the trouble of the industrial device received from said supervisory equipment by said means of communications.

Management equipment of the control maintenance system characterized by having a correspondence means to determine the coping-with method for the trouble, and to notify the response indication based on the determined coping-with method to the supervisory equipment which corresponds by said means of communications.

[Claim 22] It has further the database which registers the information about maintenance of an industrial device, and the information which identifies an industrial device, the symptom of the trouble which may be generated by the industrial device, and the coping-with method for the trouble relate, and are registered into this database, and said correspondence means determines the coping-with method for the corresponding trouble with reference to this database in management equipment according to claim 21.

[Claim 23] In a control maintenance system according to claim 21, whenever it exchanges the information about maintenance of an industrial device between said monitor means, it has further a renewal means of automatic to update said database based on the contents.

[Claim 24] In a control maintenance system according to claim 22, it has further a renewal means of hand control to update said database based on the input from an operator.

[Claim 25] In a control maintenance system according to claim 21, it has further an access-permission means to permit the user of an industrial device accessing to said database.

[Claim 26] In a control maintenance system according to claim 25, it has further a communication link security means to forbid access to said database, to persons other than the user of an industrial device.

[Claim 27] In a control maintenance system according to claim 21, industrial devices are semiconductor fabrication machines and equipment.

[Claim 28] The 1st vendor which is the control maintenance approach which maintains the industrial device of a remote place, and supplies the 1st industrial device, The 2nd vendor which supplies the 2nd industrial device, and the 1st works in which the 1st and 2nd industrial devices were installed, Maintenance information is communicated through the Internet between each of the 2nd works in which the 1st and 2nd industrial devices were installed. It is the control maintenance approach which the 1st vendor carries out the centralized control of the maintenance of the 1st industrial device installed in the 1st and 2nd works, respectively, and is characterized by the 2nd vendor carrying out the centralized control of the maintenance of the 2nd industrial device installed in the 1st and 2nd works, respectively.

[Claim 29] In the control maintenance approach according to claim 28, the 1st and 2nd works are the works of the same user or a different user.

[Claim 30] It is the control maintenance approach according to claim 29, and said industrial devices are semiconductor fabrication machines and equipment.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the control maintenance system of the industrial device which needs maintenance of for example, the device for semiconductor production etc.

[0002]

[Description of the Prior Art] Conventionally, maintenance of trouble correspondence of the industrial device which needs maintenance, for example, the device for manufacture of a semiconductor device, a periodic maintenance, etc. was performing maintenance by maintenance personnel's corresponding by the telephone or facsimile at the time of trouble generating, or maintenance personnel going to device installation works periodically or immediately.

[0003]

[Problem(s) to be Solved by the Invention] However, rapid increase of a semiconductor production investment in recent years is making the situation for which maintenance personnel were chronically insufficient to the elongation of the number of installation of the device for production. Moreover, aiming at a low cost area, the remote place of domestic and overseas every place is dotted with the production base by the global breadth of production organization. By such change of a situation, compared with the former, a prompt action is becoming difficult to trouble management or scheduled maintenance, and it has been a big technical problem how this is solved. Moreover, share-ization of the information to which maintenance information remained in each production base, and exceeded the production base becomes thin with diffusion of a production base, and the technical problem that it is hard to employ experience of the past trouble efficiently also occurs.

[0004] This invention was made in view of such a technical problem, and even if it is the device installed in the remote place, it aims at offering the control maintenance system of the industrial device which enables quick and positive maintenance regardless of an area. Moreover, it aims at offering the outstanding process using this system.

[0005]

[Means for Solving the Problem] The desirable gestalt of this invention which solves the above-mentioned technical problem is a control maintenance system which maintains the industrial device of a remote place, and is a control maintenance system characterized by having a monitor means to supervise the working state of 1 or two or more industrial devices, and the management tool which manages maintenance of an industrial device while communicating the information about maintenance of an industrial device between said monitor means through the Internet.

[0006] Since another gestalt of this invention constitutes the control maintenance system which maintains the industrial device of a remote place An acquisition means to acquire the status information which is supervisory equipment formed in an industrial device side, detects generating of the trouble of 1 or two or more industrial devices, and shows the symptom of the trouble, While notifying the status information acquired with said acquisition means through the Internet to the management equipment which carries out the centralized control of the maintenance of an industrial device It is supervisory

equipment of the control maintenance system characterized by having the means of communications which receives the response indication which answers the notice and is sent through the Internet from said management equipment.

[0007] Since another gestalt of this invention constitutes the control maintenance system which maintains the industrial device of a remote place The means of communications which communicates through each monitor means and the Internet of 1 or two or more works in which it is management equipment formed in a vendor side, and the supervisory equipment which supervises the working state of 1 or two or more industrial devices was installed, It is based on the status information about the symptom of the trouble of the industrial device received from said supervisory equipment by said means of communications. It is management equipment of the control maintenance system characterized by having a correspondence means to determine the coping-with method for the trouble, and to notify the response indication based on the determined coping-with method to the supervisory equipment which corresponds by said means of communications.

[0008] The 1st vendor which another gestalt of this invention is the control maintenance approach which maintains the industrial device of a remote place, and supplies the 1st industrial device, The 2nd vendor which supplies the 2nd industrial device, and the 1st works in which the 1st and 2nd industrial devices were installed, Maintenance information is communicated through the Internet between each of the 2nd works in which the 1st and 2nd industrial devices were installed. It is the control maintenance approach which the 1st vendor carries out the centralized control of the maintenance of the 1st industrial device installed in the 1st and 2nd works, respectively, and is characterized by the 2nd vendor carrying out the centralized control of the maintenance of the 2nd industrial device installed in the 1st and 2nd works, respectively.

[0009] And the approach of producing a semiconductor device using this control maintenance system, and the device characterized by being produced by this approach are also contained under the category of this invention.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing.

[0011] <Gestalt of operation of the 1st of control maintenance system of industrial device> drawing 1 is drawing showing the outline of the control maintenance system of the industrial device concerning the gestalt of suitable operation of this invention. 101 is the place of business of the vendor (equipment supply manufacturer) which offers an industrial device. The gestalt of this operation assumes the semiconductor fabrication machines and equipment (assembly equipment, test equipment, etc.) used by the semi-conductor plant, for example, the devices for last processes (an aligner, a spreading developer, thermal treatment equipment, etc.) and the devices for back processes, as an industrial device.

[0012] 102-104 are the production works of the semi-conductor manufacture manufacturer as a user of an industrial device. The production works 102-104 may be the works belonging to a mutually different manufacturer, and may be the works (for example, works for last processes, works for back processes, etc.) belonging to the same manufacturer.

[0013] The host computer 107 as LAN (intranet)109 which connects them to two or more industrial devices 106, and supervisory equipment which supervises the operation situation of each industrial device 106 is formed in each works 102-104, respectively.

[0014] The host computer 107 formed in each works 102-104 is connected to the host computer 108 which is management equipment by the side of a vendor 101 through the Internet 105 which is the means of communications which spread on a scale of being worldwide. A host computer 107 notifies the status information (for example, symptom of the industrial device which the trouble generated) which shows the operation situation of each industrial device 106 to a vendor side from a works side through this Internet 105, and also can receive the response indication (for example, information, the program and data for management which direct the solution for a trouble) corresponding to that notice from a vendor side. In addition, below, status information and/or a response indication are called maintenance information.

[0015] The packet communications protocol (TCP/IP) currently generally used by the Internet is used for the communication link between each works 102-104 and a vendor 101, and the communication link by LAN in each works.

[0016] The host computer 108 by the side of a vendor 101 can grasp the operation situation of the industrial device 106 in each works 102-104 of a user every moment through the Internet 105.

Moreover, the maintenance information which shows these operation situations, situations of maintenance, etc. can be referred to also from the computer 110 of a manufacturing department besides each section of a vendor 101, for example, a maintenance section, and a development section, and, thereby, can feed back maintenance information to manufacture and a development section.

[0017] Drawing 2 is a flow chart which shows actuation of the host computer 107 installed in each works. A host computer 107 supervises periodically the operation situation of the industrial device 106 of two or more (n) bases connected through LAN109 by performing periodically processing shown in this flow chart. And when the trouble has occurred, a host computer 107 acquires the status information relevant to the trouble of the symptom and others of a trouble, and notifies it to a vendor 101 side through the Internet 105.

[0018] the example shown in the flow chart of drawing 2 -- the industrial device 106 of the plurality [ host computer / 107 ] for a monitor -- the 1- it identifies as n-th industrial device, and manages. And when the operation situation of the i-th industrial device is supervised (step S203) and the trouble has occurred, carrying out sequential increment of the parameter i (steps S207 and S208), from the corresponding industrial device, the status information about the working state is acquired (step S204), and the status information is reported to a vendor 101 side through the Internet 105 (step S205). And based on the response indication which answers a report of status information and is transmitted from a vendor 101 side, in being possible, it maintains automatically the industrial device applied to a trouble through LAN109 (step S206). (when a trouble is solvable with renewal of software etc.) In addition, when automatic maintenance of a trouble cannot be performed, a message to that effect is displayed on a display.

[0019] Each industrial device 106 notifies the existence of generating of a trouble to a host computer 107 according to the demand from a host computer 107 (it corresponds to step S203), the contents of the trouble are specified further, and it has the function which notifies the status information (for example, error code which shows the contents of the trouble) which shows the specified contents to a host computer 107 (it corresponds to step S204).

[0020] In step S205, the time amount which the model of industrial device which the trouble generated, the serial number, the error code, and the trouble generated is included in the status information which a host computer 107 notifies to a vendor 101 side. The correspondence relation between this error code and the contents of the trouble can be updated at any time from the host computer 108 by the side of a vendor 101 through the Internet 105.

[0021] In addition, what is necessary is just to include the error code which shows that in status information, when the contents of the trouble are not registered beforehand. In this case, an operator will tell a vendor side about detailed information with means, such as a telephone, facsimile, and an electronic mail.

[0022] On the other hand, the host computer 108 which is management equipment by the side of a vendor 101 stands by in organization for 24 hours as opposed to the communication link from the host computer 107 installed in each works. Drawing 3 is a flow chart which shows actuation of the host computer 108 by the side of a vendor 101.

[0023] The host computer 108 by the side of a vendor 101 supervises the operation situation of the industrial device 106 of each works 102-104 by performing periodically processing shown in the flow chart of drawing 3 .

[0024] First, when it supervises whether a host computer 108 has a report (notice of status information) of a trouble (step S302) and there is a report, the status information concerning the report is acquired (step S303). And a host computer 108 investigates whether whether the same symptom's having occurred in the past and the same symptom are registered into the trouble database (the below-

mentioned 501) about the industrial device concerning the report concerned with reference to the trouble database (DB) for managing maintenance of the industrial device of each works based on this status information (step S304).

[0025] consequently, when registered (it sets to step S304 and is "yes") furthermore, judge whether the coping-with method for the symptom is registered into the trouble database (step S306), and when registered The response indications (for example, code information, a message, a program, data for management in which the coping-with method is shown) about the registered coping-with method are notified to the host computer 107 of the works concerning a report of a trouble through the Internet 105 (step S307).

[0026] Based on the response indication, when possible, the host computer 107 by the side of the works which received the notice of a response indication returns the industrial device which corresponds automatically to a normal condition, and when it is impossible, it outputs the message to the operator of the industrial device concerned to a display etc.

[0027] Subsequently, a host computer 108 reports the information to which the fact of trouble generating, the contents (status information) of the trouble, the existence of a notice of the coping-with method (response indication), and a current condition and current others relate to the person in charge by the side of a vendor 101. This report is performed to a vendor person's in charge addressing to a mail address by transmitting the electronic mail of a report automatically from a host computer 108 while displaying it on the display of a computer 110.

[0028] Here, in step S304, when it is judged that the same symptom as the symptom concerning the trouble concerned is not registered into a trouble database, after registering the symptom concerned into a trouble database newly, step S308 is performed.

[0029] If a report (step S308) to an operator finishes, a host computer 108 will update a trouble database (step S309). The existence of transmission of for example, the coping-with method (response indication), the time amount which received the report of a trouble are registered into a trouble database by this updating.

[0030] Drawing 4 is drawing showing an example of the flow of the measure which the person in charge of a maintenance section who received the report at step S308 can take. First, with reference to a trouble database, a person in charge grasps the contents of the trouble and judges whether management is required (step S402). And when there is no need for management, the working state of the industrial device 106 which corresponds through the Internet 105 in preparation for reappearance of a trouble is supervised (step S404). (for example, when the proper coping-with method is notified to the corresponding works at step S307)

[0031] On the other hand, when management is required (it sets to step S403 and is "No"), a person in charge chooses the optimal management plan with reference to the information accumulated in the trouble database (step S403).

[0032] As this management plan, it is possible first to solve a trouble on-line through the Internet 105 (step S407). As this example, the case where the cause of a trouble originates in the error of software is mentioned. In this case, it is also possible to correct the parameter and program in the memory of the corresponding industrial device on-line through the host computer 107 by the side of the Internet 105 and works.

[0033] As other management plans, it is possible to the operator of works to direct the solution approach of a trouble with means, such as an electronic mail, facsimile, and a telephone, (step S406).

[0034] By any approach of steps S405 and S406, in the case of the serious trouble which cannot be coped with, it will visit works, and it will be coped with (step S405).

[0035] If management is completed, a person in charge will update a trouble database by operating a host computer 108 or a computer 110 based on the information about the trouble concerned (step S409).

[0036] Next, the trouble database with which the host computer 108 by the side of a vendor 101 was equipped is explained. The console of the industrial device 106 of each works connected to each computer 110 pan connected to the host computer 108 through LAN109 through the Internet contains dedication or general-purpose browser software, and, thereby, constitutes the user interface of a screen

as shows an example to drawing 5 .

[0037] A vendor or the operator of each works can input information, such as the model (401) of industrial device, a serial number (402), the subject name (403) of a trouble, a generating day (404), an urgency (405), a symptom (406), the coping-with method (407), and progress (408), referring to the screen which shows an example to drawing 5 . In addition, the input of the information on a trouble database may be automatically performed with a host computer 108 as mentioned above.

[0038] The browser software concerning the screen shown in drawing 5 has a hyperlink function (410-412), and thereby, the staff of each section of a vendor and the operator of works can access the still more detailed information for example, on each item, can pull out the software of the latest version from the library of software, or can pull out the actuation guide (auxiliary information) with which reference of the operator of works is presented.

[0039] The staff of each section by the side of a vendor 101, for example, a maintenance section, a manufacturing department, and a development section can access a trouble database using the computer 110 connected to the host computer 108 through LAN109 as mentioned above. Moreover, the maintenance personnel of an area around can also access this trouble database with a personal digital assistant etc. through the Internet 105. By this, the information on each section of a vendor can be managed unitary, and the newest information can always come to hand in each section.

[0040] Moreover, by opening a part of information on a trouble database to a user (works) side, a user can obtain various maintenance information accumulated in the past through the Internet, and oneself can take suitable management to a trouble. Thus, in the base of this operation, the effectiveness of maintenance is raised by leaps and bounds by share-izing maintenance information between a vendor and two or more users.

[0041] Furthermore, with the gestalt of this operation, when a third person accesses a trouble database through the Internet, it has the communication link security system for forbidding extra sensitive information from coming to hand.

[0042] That is, in this system, access by computers other than the registered computer is forbidden by preparing a firewall and registering into the host computer 108 of a vendor 101 beforehand the computer which permits access in addition to authentication with a password.

[0043] Drawing 6 is drawing showing the communication link security structure of a system concerning the gestalt of this operation. The communication link at the time of a user accessing the trouble database 501 of the host computer 108 by the side of a vendor 101 using a browser 500 is performed by the enciphered packet communication. Both the host computers 107,108 reached the code and the decoder 502,504, and are equipped with the communication link controller 503,505, respectively. The algorithm of a code and decode can raise security by preparing according to an individual in each works (user) of every (the code and decoder by the side of a vendor being made to correspond to two or more algorithms), and changing the algorithm of this code and decode periodically further.

[0044] As mentioned above, since the Internet which is the existing infrastructure and its communications protocol, and the software further for Internet accesses are utilized in the system of this operation gestalt and the maintenance information on an industrial device was made to communicate, construction of permanent communication <sup>LINE</sup>~~Rhine~~, the burden of a new software development, etc. are mitigated, and construction of a control maintenance system [ that it is quick and low cost ] is enabled.

[0045] Moreover, by connecting two or more works in which the industrial device was installed, and the managerial system of a vendor by means of communications, managing various maintenance information intensively, and share-izing information, experience of the past trouble can be efficiently employed across a production base, and it can respond promptly to a trouble. If maintenance information is shared also among especially different user companies, it can contribute also to the improvement in increase in efficiency of the whole industry.

[0046] <Operation gestalt of \*\* 2nd of control maintenance system of industrial device> drawing 7 is the conceptual diagram of the industrial device maintenance system of the 2nd operation gestalt of this invention. Although each connected two or more user works equipped with the industrial device, and the managerial system of the vendor of this industrial device by means of communications and

communicated the maintenance information on the industrial device of each works through this means of communications with the previous operation gestalt. With this operation gestalt, the works further equipped with the industrial device of two or more vendors in addition and the managerial system of each vendor of two or more of these industrial devices are connected by the means of communications using the Internet, and the maintenance information on each industrial device is communicated through this means of communications.

[0047] In drawing 7, 201 is an industrial device user's (semiconductor device manufacturer) production works, and the aligner 202 which is equipment for semiconductor device manufacture, the spreading developer 203, the thermal treatment equipment 204, etc. are introduced into the production line of works. In addition, in drawing 7, although only one production works 201 are drawn, two or more works are similarly connected by network in practice. Each of these equipments are connected by LAN206 (intranet), and operation management of Rhine is carried out with the host computer 205 for production controls. On the other hand, each place of business of vendors (equipment supply manufacturer), such as the aligner manufacturer 210, the spreading developer manufacturer 220, and the thermal-treatment-equipment manufacturer 230, is equipped with the host managerial system 211,221,231 for performing control maintenance of a feeder machine, respectively. And the host computer 205 which manages each equipment in a user's production works, and the managerial system 211,221,231 of the vendor of each equipment are connected by the Internet 200 which is means of communications. In addition, in each vendor 210,220,230, as the example of previous drawing 1 explained, the centralized control of the maintenance of the equipment which the it in two or more users' works supplied is carried out.

[0048] In this system, although operation of a production line will stop if a trouble occurs in one of a series of production devices of a production line, a prompt action is possible by receiving the control maintenance through the Internet 200 from the vendor of the device by which the trouble occurred, and a pause of a production line can be suppressed to the minimum. The host managerial system of each vendor is equipped with a trouble database which was explained with the operation gestalt of the above 1st, and maintenance information is accumulated. Moreover, the communication link with production works and each vendor was equipped with a different communication link security system, and secret leakage is prevented. Since the concrete contents and the concrete approach of maintenance are the same as that of the 1st operation gestalt, detailed explanation is omitted.

[0049] It is possible to receive quick maintenance from the vendor which corresponds even if a trouble arises by the device during production, since the same or works of a different user's plurality which have the industrial device of two or more vendors in a production line in the system of this operation gestalt, and the managerial system of each vendor are connected by means of communications and maintenance information was made to communicate as mentioned above, the time amount at which Rhine stops can be suppressed to the minimum, and productive efficiency can be raised. If especially different user companies or different vendor companies also shares maintenance information, it can contribute also to the improvement in increase in efficiency of the whole industry.

[0050] The example of the process of the semiconductor device in the facility using <the operation gestalt of a semiconductor device process>, next the control maintenance system which gave [ above-mentioned ] explanation is explained.

[0051] Drawing 8 shows the flow of manufacture of minute devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.). The circuit design of a semiconductor device is performed at step 1 (circuit design). The mask in which the designed circuit pattern was formed is manufactured at step 2 (mask manufacture). On the other hand, at step 3 (wafer manufacture), a wafer is manufactured using ingredients, such as silicon. Step 4 (wafer process) is called a last process, and forms an actual circuit on a wafer with a lithography technique using the mask and wafer which carried out [ above-mentioned ] preparation. The following step 5 (assembly) is called a back process, is a process semiconductor-chip-ized using the wafer produced by step 4, and includes processes, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At step 6 (inspection), the check test of the semiconductor device produced at step 5 of

operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (step 7). A last process and a back process are performed at another works of dedication, respectively, and maintenance is made by the control maintenance system which gave [ above-mentioned ] explanation for every works of these.

[0052] Drawing 9 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at step 11 (oxidation). An insulator layer is formed in a wafer front face at step 12 (CVD). At step 13 (electrode formation), an electrode is formed by vacuum evaporation on a wafer. Ion is driven into a wafer at step 14 (ion implantation). A sensitization agent is applied to a wafer at step 15 (resist processing). At step 16 (exposure), printing exposure of the circuit pattern of a mask is carried out with an aligner at a wafer. The exposed wafer is developed at step 17 (development). At step 18 (etching), parts other than the developed resist image are shaved off. The resist which etching could be managed with step 19 (resist exfoliation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex. Even if a trouble occurs, quick restoration can be possible for it, and the production device used at each process can raise the productivity of a semiconductor device compared with the former while it prevents a trouble, since maintenance is made by the control maintenance system which gave [ above-mentioned ] explanation.

[0053]

[Effect of the Invention] According to this invention, it becomes possible above as means of communications of the control maintenance of an industrial device to build an effective maintenance system by little investment, without asking the installation area of a device by using the Internet covered globally.

[0054] Moreover, by connecting the user works in which the industrial device was installed, and the managerial system of a vendor by means of communications, and performing control maintenance, it can respond promptly to a trouble and improvement in maintenance capacity can also be expected by share-ization of maintenance information.

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**TECHNICAL FIELD**

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**[Field of the Invention]** This invention relates to the control maintenance system of the industrial device which needs maintenance of for example, the device for semiconductor production etc.

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[Translation done.]

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**PRIOR ART**

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[Description of the Prior Art] Conventionally, maintenance of trouble correspondence of the industrial device which needs maintenance, for example, the device for manufacture of a semiconductor device, a periodic maintenance, etc. was performing maintenance by maintenance personnel's corresponding by the telephone or facsimile at the time of trouble generating, or maintenance personnel going to device installation works periodically or immediately.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] According to this invention, it becomes possible above as means of communications of the control maintenance of an industrial device to build an effective maintenance system by little investment, without asking the installation area of a device by using the Internet covered globally.

[0054] Moreover, by connecting the user works in which the industrial device was installed, and the managerial system of a vendor by means of communications, and performing control maintenance, it can respond promptly to a trouble and improvement in maintenance capacity can also be expected by share-ization of maintenance information.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, rapid increase of a semiconductor production investment in recent years is making the situation for which maintenance personnel were chronically insufficient to the elongation of the number of installation of the device for production. Moreover, aiming at a low cost area, the remote place of domestic and overseas every place is dotted with the production base by the global breadth of production organization. By such change of a situation, compared with the former, a prompt action is becoming difficult to trouble management or scheduled maintenance, and it has been a big technical problem how this is solved. Moreover, share-ization of the information to which maintenance information remained in each production base, and exceeded the production base becomes thin with diffusion of a production base, and the technical problem that it is hard to employ experience of the past trouble efficiently also occurs.

[0004] This invention was made in view of such a technical problem, and even if it is the device installed in the remote place, it aims at offering the control maintenance system of the industrial device which enables quick and positive maintenance regardless of an area. Moreover, it aims at offering the outstanding process using this system.

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[Translation done.]

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MEANS

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[Means for Solving the Problem] The desirable gestalt of this invention which solves the above-mentioned technical problem is a control maintenance system which maintains the industrial device of a remote place, and is a control maintenance system characterized by having a monitor means to supervise the working state of 1 or two or more industrial devices, and the management tool which manages maintenance of an industrial device while communicating the information about maintenance of an industrial device between said monitor means through the Internet.

[0006] Since another gestalt of this invention constitutes the control maintenance system which maintains the industrial device of a remote place An acquisition means to acquire the status information which is supervisory equipment formed in an industrial device side, detects generating of the trouble of 1 or two or more industrial devices, and shows the symptom of the trouble, While notifying the status information acquired with said acquisition means through the Internet to the management equipment which carries out the centralized control of the maintenance of an industrial device It is supervisory equipment of the control maintenance system characterized by having the means of communications which receives the response indication which answers the notice and is sent through the Internet from said management equipment.

[0007] Since another gestalt of this invention constitutes the control maintenance system which maintains the industrial device of a remote place The means of communications which communicates through each monitor means and the Internet of 1 or two or more works in which it is management equipment formed in a vendor side, and the supervisory equipment which supervises the working state of 1 or two or more industrial devices was installed, It is based on the status information about the symptom of the trouble of the industrial device received from said supervisory equipment by said means of communications. It is management equipment of the control maintenance system characterized by having a correspondence means to determine the coping-with method for the trouble, and to notify the response indication based on the determined coping-with method to the supervisory equipment which corresponds by said means of communications.

[0008] The 1st vendor which another gestalt of this invention is the control maintenance approach which maintains the industrial device of a remote place, and supplies the 1st industrial device, The 2nd vendor which supplies the 2nd industrial device, and the 1st works in which the 1st and 2nd industrial devices were installed, Maintenance information is communicated through the Internet between each of the 2nd works in which the 1st and 2nd industrial devices were installed. It is the control maintenance approach which the 1st vendor carries out the centralized control of the maintenance of the 1st industrial device installed in the 1st and 2nd works, respectively, and is characterized by the 2nd vendor carrying out the centralized control of the maintenance of the 2nd industrial device installed in the 1st and 2nd works, respectively.

[0009] And the approach of producing a semiconductor device using this control maintenance system, and the device characterized by being produced by this approach are also contained under the category of this invention.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing.

[0011] <Gestalt of operation of the 1st of control maintenance system of industrial device> drawing 1 is drawing showing the outline of the control maintenance system of the industrial device concerning the gestalt of suitable operation of this invention. 101 is the place of business of the vendor (equipment supply manufacturer) which offers an industrial device. The gestalt of this operation assumes the semiconductor fabrication machines and equipment (assembly equipment, test equipment, etc.) used by the semi-conductor plant, for example, the devices for last processes (an aligner, a spreading developer, thermal treatment equipment, etc.) and the devices for back processes, as an industrial device.

[0012] 102-104 are the production works of the semi-conductor manufacturer manufacturer as a user of an industrial device. The production works 102-104 may be the works belonging to a mutually different manufacturer, and may be the works (for example, works for last processes, works for back processes, etc.) belonging to the same manufacturer.

[0013] The host computer 107 as LAN (intranet) 109 which connects them to two or more industrial devices 106, and supervisory equipment which supervises the operation situation of each industrial device 106 is formed in each works 102-104, respectively.

[0014] The host computer 107 formed in each works 102-104 is connected to the host computer 108 which is management equipment by the side of a vendor 101 through the Internet 105 which is the means of communications which spread on a scale of being worldwide. A host computer 107 notifies the status information (for example, symptom of the industrial device which the trouble generated) which shows the operation situation of each industrial device 106 to a vendor side from a works side through this Internet 105, and also can receive the response indication (for example, information, the program and data for management which direct the solution for a trouble) corresponding to that notice from a vendor side. In addition, below, status information and/or a response indication are called maintenance information.

[0015] The packet communications protocol (TCP/IP) currently generally used by the Internet is used for the communication link between each works 102-104 and a vendor 101, and the communication link by LAN in each works.

[0016] The host computer 108 by the side of a vendor 101 can grasp the operation situation of the industrial device 106 in each works 102-104 of a user every moment through the Internet 105. Moreover, the maintenance information which shows these operation situations, situations of maintenance, etc. can be referred to also from the computer 110 of a manufacturing department besides each section of a vendor 101, for example, a maintenance section, and a development section, and, thereby, can feed back maintenance information to manufacture and a development section.

[0017] Drawing 2 is a flow chart which shows actuation of the host computer 107 installed in each works. A host computer 107 supervises periodically the operation situation of the industrial device 106 of two or more (n) bases connected through LAN109 by performing periodically processing shown in this flow chart. And when the trouble has occurred, a host computer 107 acquires the status information relevant to the trouble of the symptom and others of a trouble, and notifies it to a vendor 101 side through the Internet 105.

[0018] the example shown in the flow chart of drawing 2 -- the industrial device 106 of the plurality [ host computer / 107 ] for a monitor -- the 1- it identifies as n-th industrial device, and manages. And when the operation situation of the i-th industrial device is supervised (step S203) and the trouble has occurred, carrying out sequential increment of the parameter i (steps S207 and S208), from the corresponding industrial device, the status information about the working state is acquired (step S204), and the status information is reported to a vendor 101 side through the Internet 105 (step S205). And based on the response indication which answers a report of status information and is transmitted from a vendor 101 side, in being possible, it maintains automatically the industrial device applied to a trouble through LAN109 (step S206). (when a trouble is solvable with renewal of software etc.) In addition, when automatic maintenance of a trouble cannot be performed, a message to that effect is displayed on a display.

[0019] Each industrial device 106 notifies the existence of generating of a trouble to a host computer 107 according to the demand from a host computer 107 (it corresponds to step S203), the contents of the trouble are specified further, and it has the function which notifies the status information (for example, error code which shows the contents of the trouble) which shows the specified contents to a host computer 107 (it corresponds to step S204).

[0020] In step S205, the time amount which the model of industrial device which the trouble generated, the serial number, the error code, and the trouble generated is included in the status information which a host computer 107 notifies to a vendor 101 side. The correspondence relation between this error code and the contents of the trouble can be updated at any time from the host computer 108 by the side of a vendor 101 through the Internet 105.

[0021] In addition, what is necessary is just to include the error code which shows that in status information, when the contents of the trouble are not registered beforehand. In this case, an operator will tell a vendor side about detailed information with means, such as a telephone, facsimile, and an electronic mail.

[0022] On the other hand, the host computer 108 which is management equipment by the side of a vendor 101 stands by in organization for 24 hours as opposed to the communication link from the host computer 107 installed in each works. Drawing 3 is a flow chart which shows actuation of the host computer 108 by the side of a vendor 101.

[0023] The host computer 108 by the side of a vendor 101 supervises the operation situation of the industrial device 106 of each works 102-104 by performing periodically processing shown in the flow chart of drawing 3.

[0024] First, when it supervises whether a host computer 108 has a report (notice of status information) of a trouble (step S302) and there is a report, the status information concerning the report is acquired (step S303). And a host computer 108 investigates whether whether the same symptom's having occurred in the past and the same symptom are registered into the trouble database (the below-mentioned 501) about the industrial device concerning the report concerned with reference to the trouble database (DB) for managing maintenance of the industrial device of each works based on this status information (step S304).

[0025] consequently, when registered (it sets to step S304 and is "yes") furthermore, judge whether the coping-with method for the symptom is registered into the trouble database (step S306), and when registered The response indications (for example, code information, a message, a program, data for management in which the coping-with method is shown) about the registered coping-with method are notified to the host computer 107 of the works concerning a report of a trouble through the Internet 105 (step S307).

[0026] Based on the response indication, when possible, the host computer 107 by the side of the works which received the notice of a response indication returns the industrial device which corresponds automatically to a normal condition, and when it is impossible, it outputs the message to the operator of the industrial device concerned to a display etc.

[0027] Subsequently, a host computer 108 reports the information to which the fact of trouble generating, the contents (status information) of the trouble, the existence of a notice of the coping-with method (response indication), and a current condition and current others relate to the person in charge by the side of a vendor 101. This report is performed to a vendor person's in charge addressing to a mail address by transmitting the electronic mail of a report automatically from a host computer 108 while displaying it on the display of a computer 110.

[0028] Here, in step S304, when it is judged that the same symptom as the symptom concerning the trouble concerned is not registered into a trouble database, after registering the symptom concerned into a trouble database newly, step S308 is performed.

[0029] If a report (step S308) to an operator finishes, a host computer 108 will update a trouble database (step S309). The existence of transmission of for example, the coping-with method (response indication), the time amount which received the report of a trouble are registered into a trouble database by this updating.

[0030] Drawing 4 is drawing showing an example of the flow of the measure which the person in charge of a maintenance section who received the report at step S308 can take. First, with reference to a trouble database, a person in charge grasps the contents of the trouble and judges whether management is required (step S402). And when there is no need for management, the working state of the industrial device 106 which corresponds through the Internet 105 in preparation for reappearance of a trouble is supervised (step S404). (for example, when the proper coping-with method is notified to the corresponding works at step S307)

[0031] On the other hand, when management is required (it sets to step S403 and is "No"), a person in charge chooses the optimal management plan with reference to the information accumulated in the trouble database (step S403).

[0032] As this management plan, it is possible first to solve a trouble on-line through the Internet 105 (step S407). As this example, the case where the cause of a trouble originates in the error of software is mentioned. In this case, it is also possible to correct the parameter and program in the memory of the corresponding industrial device on-line through the host computer 107 by the side of the Internet 105 and works.

[0033] As other management plans, it is possible to the operator of works to direct the solution approach of a trouble with means, such as an electronic mail, facsimile, and a telephone, (step S406).

[0034] By any approach of steps S405 and S406, in the case of the serious trouble which cannot be coped with, it will visit works, and it will be coped with (step S405).

[0035] If management is completed, a person in charge will update a trouble database by operating a host computer 108 or a computer 110 based on the information about the trouble concerned (step S409).

[0036] Next, the trouble database with which the host computer 108 by the side of a vendor 101 was equipped is explained. The console of the industrial device 106 of each works connected to each computer 110 pan connected to the host computer 108 through LAN109 through the Internet contains dedication or general-purpose browser software, and, thereby, constitutes the user interface of a screen as shows an example to drawing 5 .

[0037] A vendor or the operator of each works can input information, such as the model (401) of industrial device, a serial number (402), the subject name (403) of a trouble, a generating day (404), an urgency (405), a symptom (406), the coping-with method (407), and progress (408), referring to the screen which shows an example to drawing 5 . In addition, the input of the information on a trouble database may be automatically performed with a host computer 108 as mentioned above.

[0038] The browser software concerning the screen shown in drawing 5 has a hyperlink function (410-412), and thereby, the staff of each section of a vendor and the operator of works can access the still more detailed information for example, on each item, can pull out the software of the latest version from the library of software, or can pull out the actuation guide (auxiliary information) with which reference of the operator of works is presented.

[0039] The staff of each section by the side of a vendor 101, for example, a maintenance section, a manufacturing department, and a development section can access a trouble database using the computer 110 connected to the host computer 108 through LAN109 as mentioned above. Moreover, the maintenance personnel of an area around can also access this trouble database with a personal digital assistant etc. through the Internet 105. By this, the information on each section of a vendor can be managed unitary, and the newest information can always come to hand in each section.

[0040] Moreover, by opening a part of information on a trouble database to a user (works) side, a user can obtain various maintenance information accumulated in the past through the Internet, and oneself can take suitable management to a trouble. Thus, in the base of this operation, the effectiveness of maintenance is raised by leaps and bounds by share-izing maintenance information between a vendor and two or more users.

[0041] Furthermore, with the gestalt of this operation, when a third person accesses a trouble database through the Internet, it has the communication link security system for forbidding extra sensitive information from coming to hand.

[0042] That is, in this system, access by computers other than the registered computer is forbidden by

preparing a firewall and registering into the host computer 108 of a vendor 101 beforehand the computer which permits access in addition to authentication with a password.

[0043] Drawing 6 is drawing showing the communication link security structure of a system concerning the gestalt of this operation. The communication link at the time of a user accessing the trouble database 501 of the host computer 108 by the side of a vendor 101 using a browser 500 is performed by the enciphered packet communication. Both the host computers 107,108 reached the code and the decoder 502,504, and are equipped with the communication link controller 503,505, respectively. The algorithm of a code and decode can raise security by preparing according to an individual in each works (user) of every (the code and decoder by the side of a vendor being made to correspond to two or more algorithms), and changing the algorithm of this code and decode periodically further.

[0044] As mentioned above, since the Internet which is the existing infrastructure and its communications protocol, and the software further for Internet accesses are utilized in the system of this operation gestalt and the maintenance information on an industrial device was made to communicate, construction of permanent communication Rhine, the burden of a new software development, etc. are mitigated, and construction of a control maintenance system [ that it is quick and low cost ] is enabled.

[0045] Moreover, by connecting two or more works in which the industrial device was installed, and the managerial system of a vendor by means of communications, managing various maintenance information intensively, and share-izing information, experience of the past trouble can be efficiently employed across a production base, and it can respond promptly to a trouble. If maintenance information is shared also among especially different user companies, it can contribute also to the improvement in increase in efficiency of the whole industry.

[0046] <Operation gestalt of \*\* 2nd of control maintenance system of industrial device> drawing 7 is the conceptual diagram of the industrial device maintenance system of the 2nd operation gestalt of this invention. Although each connected two or more user works equipped with the industrial device, and the managerial system of the vendor of this industrial device by means of communications and communicated the maintenance information on the industrial device of each works through this means of communications with the previous operation gestalt. With this operation gestalt, the works further equipped with the industrial device of two or more vendors in addition and the managerial system of each vendor of two or more of these industrial devices are connected by the means of communications using the Internet, and the maintenance information on each industrial device is communicated through this means of communications.

[0047] In drawing 7 , 201 is an industrial device user's (semiconductor device manufacture manufacturer) production works, and the aligner 202 which is equipment for semiconductor device manufacture, the spreading developer 203, the thermal treatment equipment 204, etc. are introduced into the production line of works. In addition, in drawing 7 , although only one production works 201 are drawn, two or more works are similarly connected by network in practice. Each of these equipments are connected by LAN206 (intranet), and operation management of Rhine is carried out with the host computer 205 for production controls. On the other hand, each place of business of vendors (equipment supply manufacturer), such as the aligner manufacturer 210, the spreading developer manufacturer 220, and the thermal-treatment-equipment manufacturer 230, is equipped with the host managerial system 211,221,231 for performing control maintenance of a feeder machine, respectively. And the host computer 205 which manages each equipment in a user's production works, and the managerial system 211,221,231 of the vendor of each equipment are connected by the Internet 200 which is means of communications. In addition, in each vendor 210,220,230, as the example of previous drawing 1 explained, the centralized control of the maintenance of the equipment which the it in two or more users' works supplied is carried out.

[0048] In this system, although operation of a production line will stop if a trouble occurs in one of a series of production devices of a production line, a prompt action is possible by receiving the control maintenance through the Internet 200 from the vendor of the device by which the trouble occurred, and a pause of a production line can be suppressed to the minimum. The host managerial system of each vendor is equipped with a trouble database which was explained with the operation gestalt of the above

1st, and maintenance information is accumulated. Moreover, the communication link with production works and each vendor was equipped with a different communication link security system, and secret leakage is prevented. Since the concrete contents and the concrete approach of maintenance are the same as that of the 1st operation gestalt, detailed explanation is omitted.

[0049] It is possible to receive quick maintenance from the vendor which corresponds even if a trouble arises by the device during production, since the same or works of a different user's plurality which have the industrial device of two or more vendors in a production line in the system of this operation gestalt, and the managerial system of each vendor are connected by means of communications and maintenance information was made to communicate as mentioned above, the time amount at which Rhine stops can be suppressed to the minimum, and productive efficiency can be raised. If especially different user companies or different vendor companies also shares maintenance information, it can contribute also to the improvement in increase in efficiency of the whole industry.

[0050] The example of the process of the semiconductor device in the facility using <the operation gestalt of a semiconductor device process>, next the control maintenance system which gave [ above-mentioned ] explanation is explained.

[0051] Drawing 8 shows the flow of manufacture of minute devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.). The circuit design of a semiconductor device is performed at step 1 (circuit design). The mask in which the designed circuit pattern was formed is manufactured at step 2 (mask manufacture). On the other hand, at step 3 (wafer manufacture), a wafer is manufactured using ingredients, such as silicon. Step 4 (wafer process) is called a last process, and forms an actual circuit on a wafer with a lithography technique using the mask and wafer which carried out [ above-mentioned ] preparation. The following step 5 (assembly) is called a back process, is a process semiconductor-chip-ized using the wafer produced by step 4, and includes processes, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At step 6 (inspection), the check test of the semiconductor device produced at step 5 of operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (step 7). A last process and a back process are performed at another works of dedication, respectively, and maintenance is made by the control maintenance system which gave [ above-mentioned ] explanation for every works of these.

[0052] Drawing 9 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at step 11 (oxidation). An insulator layer is formed in a wafer front face at step 12 (CVD). At step 13 (electrode formation), an electrode is formed by vacuum evaporation on a wafer. Ion is driven into a wafer at step 14 (ion implantation). A sensitization agent is applied to a wafer at step 15 (resist processing). At step 16 (exposure), printing exposure of the circuit pattern of a mask is carried out with an aligner at a wafer. The exposed wafer is developed at step 17 (development). At step 18 (etching), parts other than the developed resist image are shaved off. The resist which etching could be managed with step 19 (resist exfoliation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex. Even if a trouble occurs, quick restoration can be possible for it, and the production device used at each process can raise the productivity of a semiconductor device compared with the former while it prevents a trouble, since maintenance is made by the control maintenance system which gave [ above-mentioned ] explanation.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is drawing showing the outline of the control maintenance system of the industrial device concerning the gestalt of operation of the 1st of this invention.

**[Drawing 2]** It is the flow chart which shows actuation of the host computer as supervisory equipment installed in the user (works) side.

**[Drawing 3]** It is drawing showing actuation of the host computer as management equipment installed in the vendor side.

**[Drawing 4]** It is drawing showing an example of the measure which the person in charge of a maintenance section can take.

**[Drawing 5]** It is drawing showing an example of the input image which is the user interface of a trouble database.

**[Drawing 6]** It is drawing showing the communication link security structure of a system.

**[Drawing 7]** It is drawing showing the outline of the control maintenance system of the industrial device concerning the gestalt of operation of the 2nd of this invention.

**[Drawing 8]** It is drawing showing the manufacture flow of a semiconductor device.

**[Drawing 9]** It is drawing showing a wafer process.

**[Description of Notations]**

101 Place of Business of Vendor

102-104 A user's production works

105 Internet

106 Industrial Device

107 Host Computer of Each Works (User)

108 Host Computer of Vendor

109 LAN

110 Computer of Each Section of Vendor

200 Internet

201 User's Production Works

202 Aligner

203 Spreading Developer

204 Thermal Treatment Equipment

205 Host Computer for Production Controls

206 LAN

210 Aligner Manufacturer Place of Business

211 Host Managerial System

220 Spreading Developer Manufacturer's Place of Business

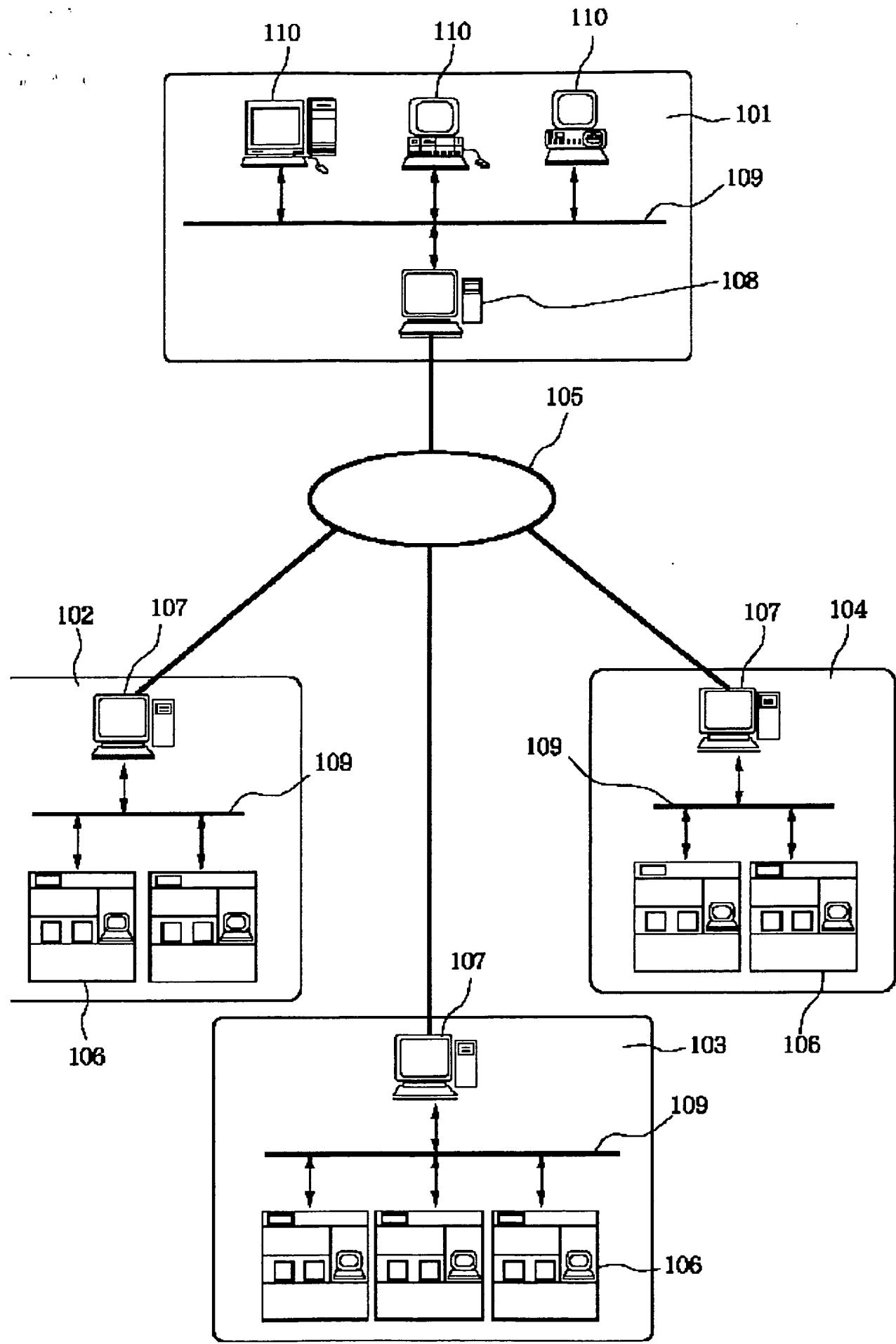
221 Host Managerial System

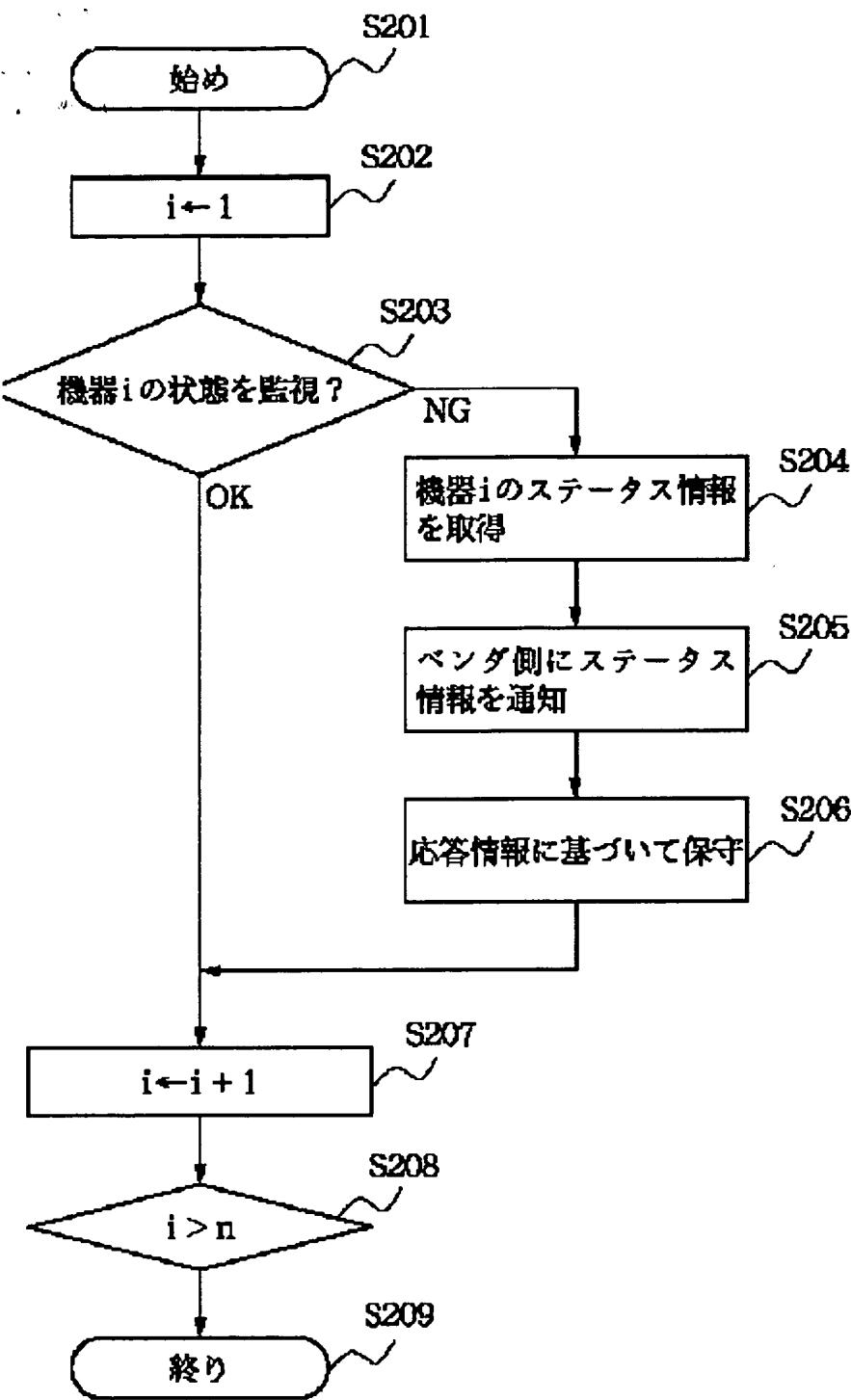
230 Thermal-Treatment-Equipment Manufacturer's Place of Business

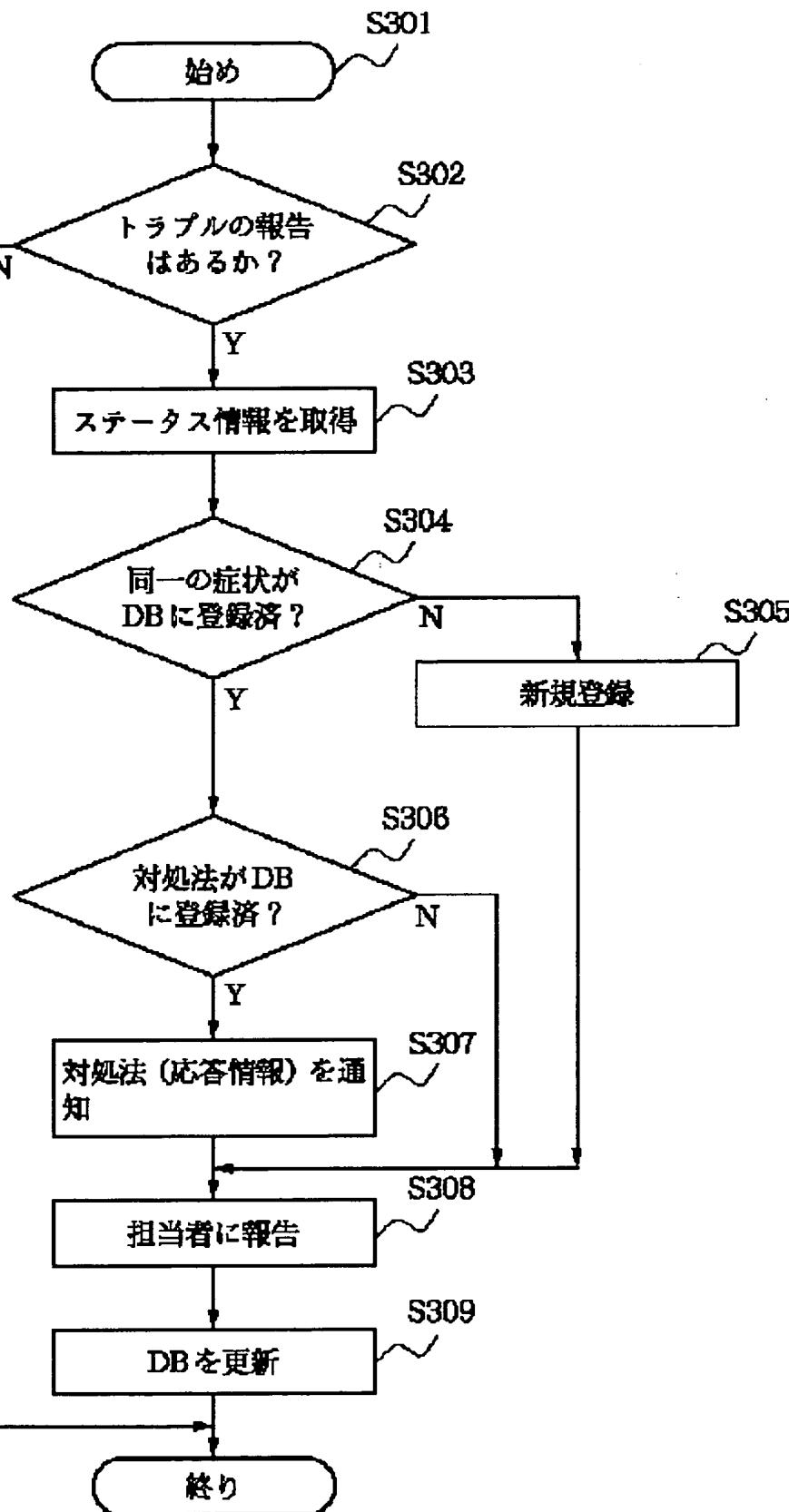
231 Host Managerial System

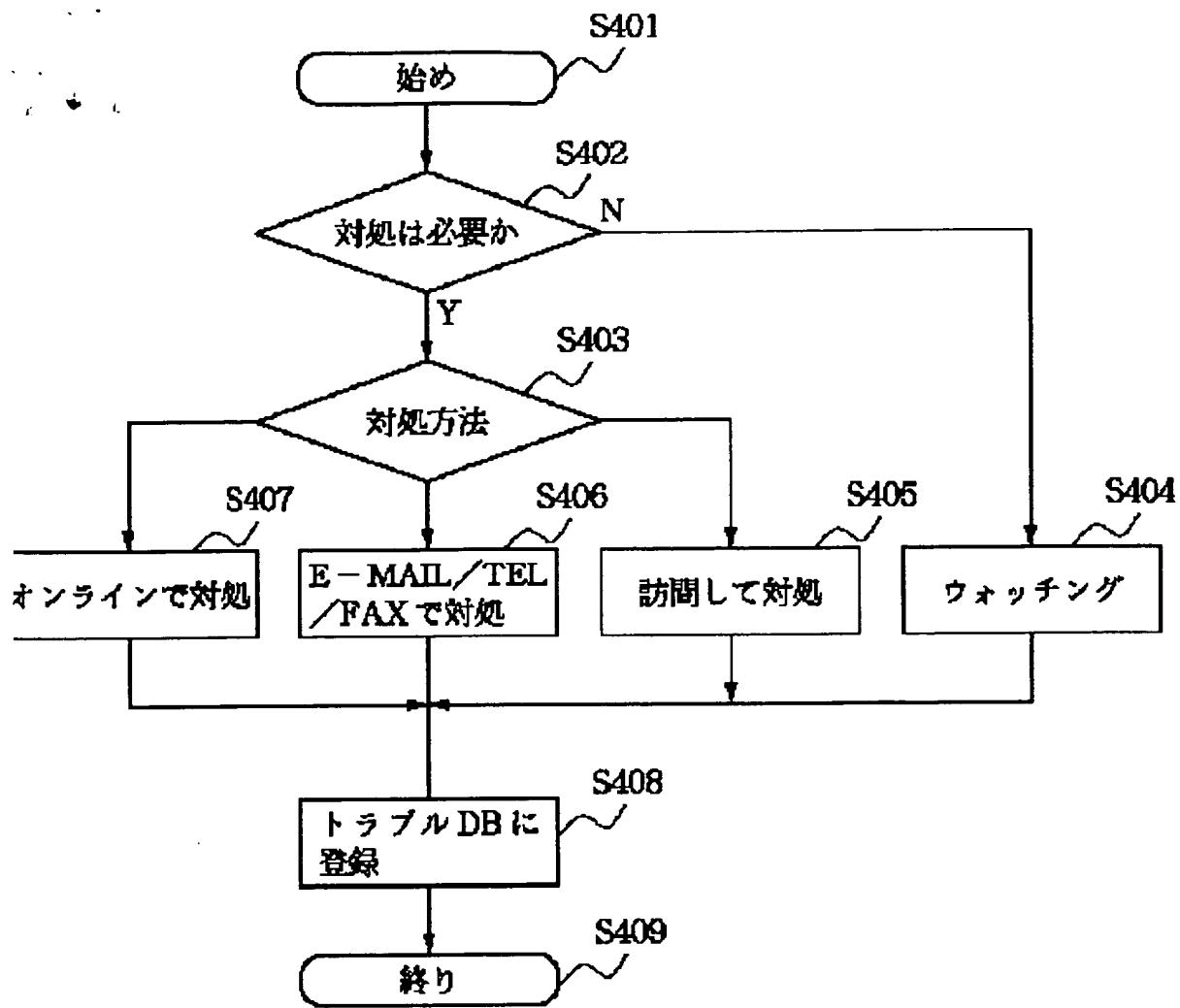
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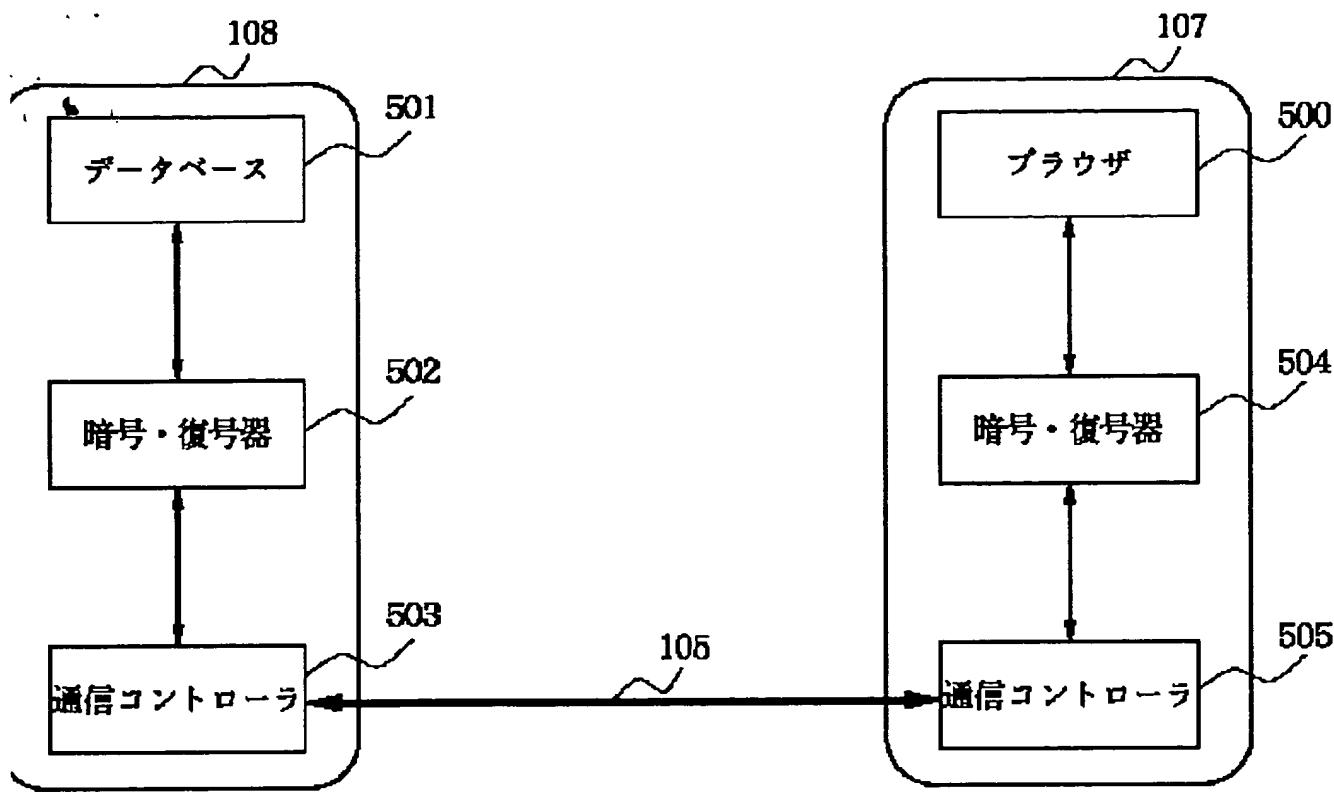


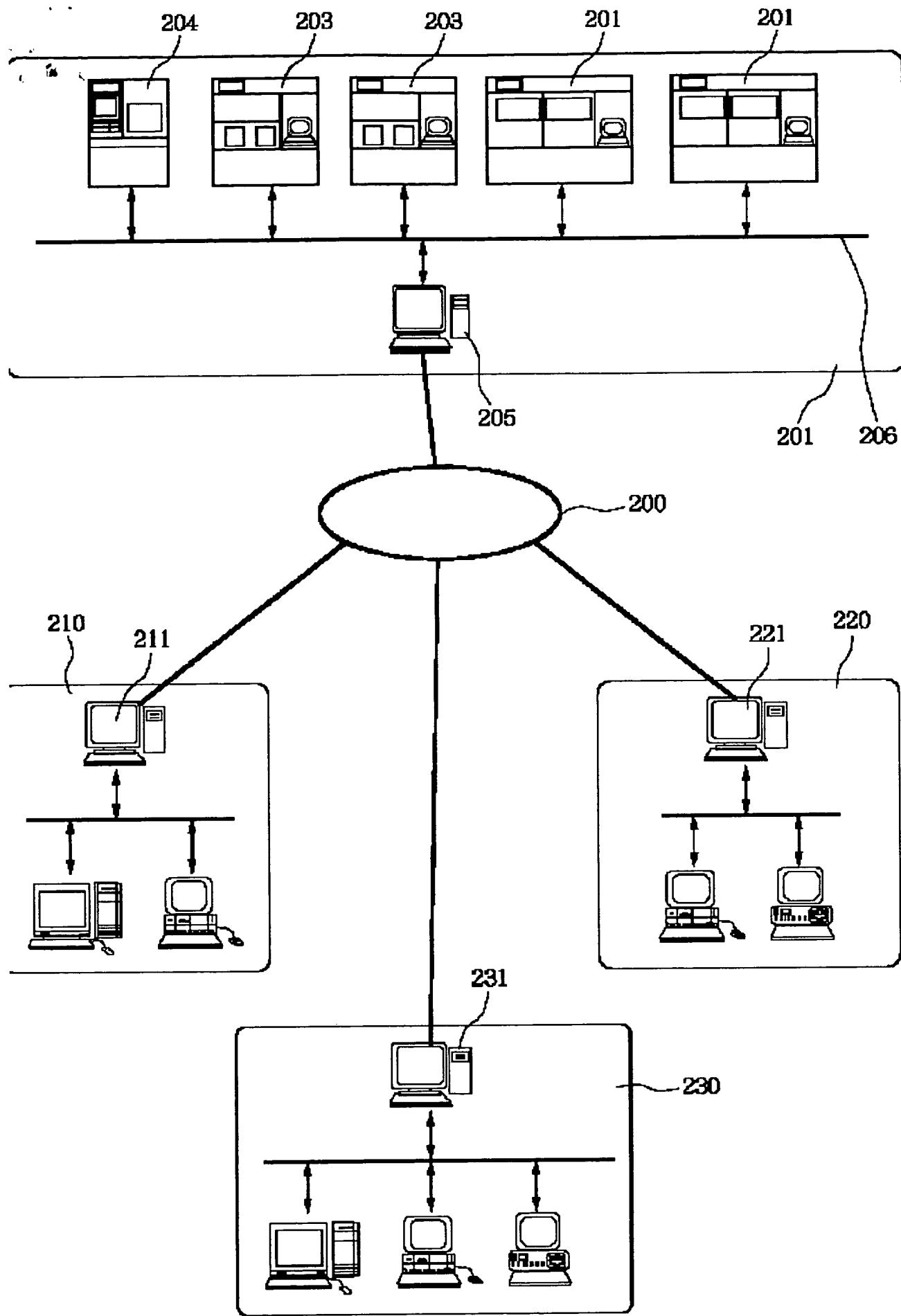


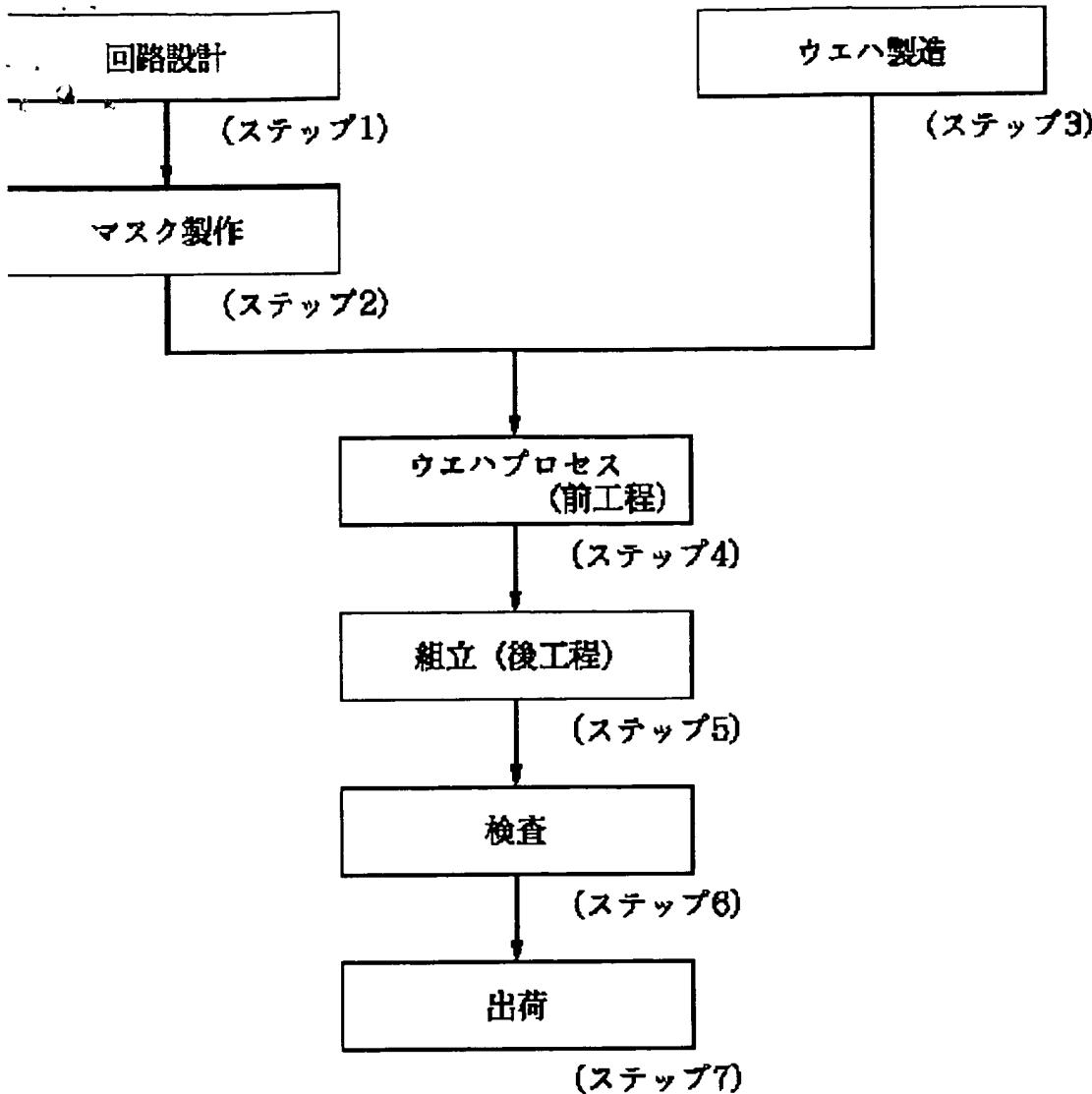
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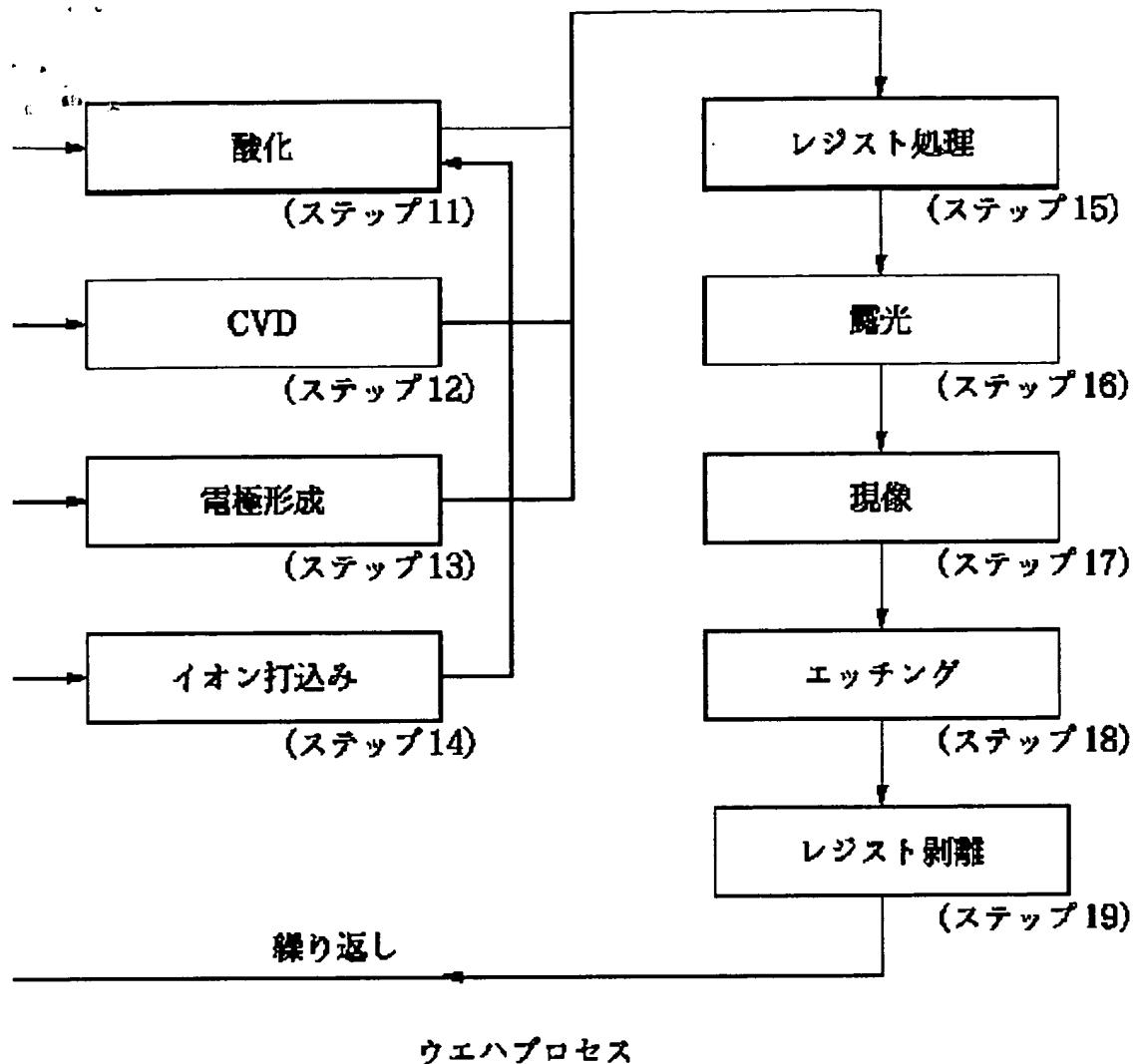
## 入力

機種  401件名  403機器 S/N  402緊急度  405症状   
406対処法   
407経過   
408送る  410 411 412[結果一覧データベースへのリンク](#)[ソフトウェアライブラリ](#)[操作ガイド](#)









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(71)出願人 000001007  
キヤノン株式会社  
東京都大田区下丸子3丁目30番2号  
(72)発明者 大串 信明  
東京都大田区下丸子3丁目30番2号キヤノン株式会社内  
(72)発明者 小倉 真哉  
東京都大田区下丸子3丁目30番2号キヤノン株式会社内  
(72)発明者 米山 好人  
東京都大田区下丸子3丁目30番2号キヤノン株式会社内  
(74)代理人 弁理士 丸島 儀一

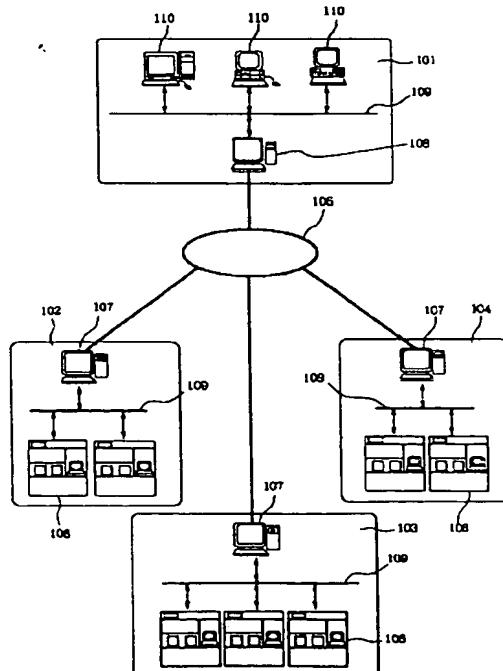
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(54)【発明の名称】 産業用機器の遠隔保守システム

(57)【要約】

【課題】 遠隔地の機器であっても地域を問わず迅速且つ確実な保守を可能とする産業用機器の遠隔保守システムを提供すること。

【解決手段】 各工場102~104に、夫々産業用機器109の監視用のホストコンピュータ107を備え、このホストコンピュータ107をベンダ101側の管理用のホストコンピュータ108とインターネット105を介して接続する。工場側のホストコンピュータ107は、産業用機器106のトラブルの発生を検知し、その症状を示すステータス情報をベンダ側に通知し、これに応答してベンダ側のホストコンピュータ108は、その症状に対応した対処を示す応答情報を工場側に通知する。



## 【特許請求の範囲】

【請求項1】 遠隔地の産業用機器を保守する遠隔保守システムであって、

1又は複数の産業用機器の稼動状態を監視する監視手段と、  
インターネットを介して前記監視手段との間で産業用機器の保守に関する情報を通信しながら産業用機器の保守を管理する管理手段と、  
を備えることを特徴とする遠隔保守システム。

【請求項2】 請求項1記載の遠隔保守システムにおいて、前記管理手段は、複数の工場に設置された各産業用機器の保守を集中管理する。

【請求項3】 請求項2記載の遠隔保守システムにおいて、複数の工場は同一あるいは異なるユーザーの複数工場であって、前記管理手段はベンダー側に備えられる。

【請求項4】 請求項1記載の遠隔保守システムにおいて、1工場内に複数種類の産業用機器が設置され、前記管理手段は各産業用機器にそれぞれ対応して複数備えられている。

【請求項5】 請求項4記載の遠隔保守システムにおいて、複数の産業用機器は異なるベンダーが供給する機器であって、前記管理手段はそれぞれ異なるベンダー側に備えられる。

【請求項6】 請求項1記載の遠隔保守システムにおいて、前記管理手段から産業用機器に、産業用機器のソフトウェア又は機器操作のガイド情報をインターネットを介して供給する手段を有する。

【請求項7】 請求項1に記載の遠隔保守システムにおいて、前記監視手段は、産業用機器のトラブルの発生を検知し、そのトラブルの症状を特定するステータス情報を前記管理手段に通知し、

前記管理手段は、そのステータス情報に基づいて当該産業用機器のトラブルに対する対処法を決定し、その決定した対処法に基づく応答情報を前記監視手段に通知する。

【請求項8】 請求項7に記載の遠隔保守システムにおいて、前記監視手段は、前記管理手段から通知された応答情報に基づいて産業用機器を保守する保守手段を有する。

【請求項9】 請求項7に記載の遠隔保守システムにおいて、前記管理手段は、前記産業用機器の保守に関する情報を登録するデータベースを有し、該データベースには、産業用機器を識別する情報と、その産業用機器で発生し得るトラブルの症状と、そのトラブルに対する対処法とが関連付けて登録されており、前記管理手段は、前記データベースを参照して、該当するトラブルに対する対処法を決定する。

【請求項10】 請求項9に記載の遠隔保守システムにおいて、前記管理手段は、前記監視手段との間で産業用

機器の保守に関する情報をやり取りする都度、その内容に基づいて前記データベースを更新する自動更新手段を有する。

【請求項11】 請求項10に記載の遠隔保守システムにおいて、前記管理手段は、オペレータからの入力情報に基づいて前記データベースを更新する手動更新手段を更に有する。

【請求項12】 請求項9に記載の遠隔保守システムにおいて、前記管理手段は、前記データベースに対してアクセスすることを、産業用機器のユーザに許可するアクセス許可手段を更に有する。

【請求項13】 請求項12に記載の遠隔保守システムにおいて、前記管理手段は、前記産業用機器のユーザ以外の者に対して、前記データベースへのアクセスを禁止する通信セキュリティ手段を更に有する。

【請求項14】 請求項9に記載の遠隔保守システムにおいて、前記監視手段は、前記管理手段が有する前記データベースにアクセスするアクセス手段を有する。

【請求項15】 請求項1に記載の遠隔保守システムにおいて、産業用機器は半導体製造装置である。

【請求項16】 請求項1に記載の遠隔保守システムに基づいて管理される半導体製造装置を用いて半導体デバイスを生産する方法。

【請求項17】 請求項1に記載の遠隔保守システムに基づいて管理される半導体製造装置を用いて生産される半導体デバイス。

【請求項18】 遠隔地の産業用機器を保守する遠隔保守システムを構成するために、産業用機器側に設けられる監視装置であって、

1又は複数の産業用機器のトラブルの発生を検知し、そのトラブルの症状を示すステータス情報を取得する取得手段と、

前記取得手段により取得したステータス情報を、インターネットを介して、産業用機器の保守を集中管理する管理装置に通知すると共に、その通知に応答して前記管理装置からインターネットを介して送られてくる応答情報を受信する通信手段と、

を備えることを特徴とする遠隔保守システムの監視装置。

【請求項19】 請求項18に記載の監視装置において、前記通信手段により前記管理装置から受信した応答情報に基づいて、産業用機器を保守する保守手段を更に備える。

【請求項20】 請求項18に記載の遠隔保守システムにおいて、産業用機器は半導体製造装置である。

【請求項21】 遠隔地の産業用機器を保守する遠隔保守システムを構成するために、ベンダー側に設けられる管理装置であって、

1又は複数の産業用機器の稼動状態を監視する監視装置が設置された1又は複数の工場の各監視手段とインター

ネットを介して通信する通信手段と、前記通信手段により前記監視装置から受信した産業用機器のトラブルの症状に関するステータス情報に基づいて、そのトラブルに対する対処法を決定し、その決定した対処法に基づく応答情報を前記通信手段により該当する監視装置に通知する対応手段と、を備えることを特徴とする遠隔保守システムの管理装置。

【請求項22】 請求項21に記載の管理装置において、産業用機器の保守に関する情報を登録するデータベースを更に備え、該データベースには、産業用機器を識別する情報と、その産業用機器で発生し得るトラブルの症状と、そのトラブルに対する対処法とが関連付けて登録されており、前記対応手段は、該データベースを参照して、該当するトラブルに対する対処法を決定する。

【請求項23】 請求項21に記載の遠隔保守システムにおいて、前記監視手段との間で産業用機器の保守に関する情報をやり取りする都度、その内容に基づいて前記データベースを更新する自動更新手段を更に備える。

【請求項24】 請求項22に記載の遠隔保守システムにおいて、オペレータからの入力情報に基づいて前記データベースを更新する手動更新手段を更に備える。

【請求項25】 請求項21に記載の遠隔保守システムにおいて、前記データベースに対してアクセスすることを、産業用機器のユーザに許可するアクセス許可手段を更に有する。

【請求項26】 請求項25に記載の遠隔保守システムにおいて、産業用機器のユーザ以外の者に対して、前記データベースへのアクセスを禁止する通信セキュリティ手段を更に有する。

【請求項27】 請求項21に記載の遠隔保守システムにおいて、産業用機器は半導体製造装置である。

【請求項28】 遠隔地の産業用機器を保守する遠隔保守方法であって、

第1の産業用機器を供給する第1のベンダーと、第2の産業用機器を供給する第2のベンダーと、第1及び第2の産業用機器が設置された第1の工場と、第1及び第2の産業用機器が設置された第2の工場の、それぞれの間でインターネットを介して保守情報を通信し、

第1のベンダーは第1及び第2の工場にそれぞれ設置された第1の産業用機器の保守を集中管理し、

第2のベンダーは第1及び第2の工場にそれぞれ設置された第2の産業用機器の保守を集中管理することを特徴とする遠隔保守方法。

【請求項29】 請求項28に記載の遠隔保守方法において、第1及び第2の工場は同一ユーザー又は異なるユーザーの工場である。

【請求項30】 請求項29に記載の遠隔保守方法であって、前記産業用機器は半導体製造装置である。

【発明の詳細な説明】

#### 【0001】

【発明の属する技術分野】本発明は、例えば半導体生産用機器などの保守を必要とする産業用機器の遠隔保守システムに関する。

#### 【0002】

【従来の技術】従来、保守を必要とする産業用機器、たとえば半導体デバイスの製造用の機器のトラブル対応や定期メンテナンスなどの保守は、保守要員がトラブル発生時に電話やファクシミリで対応したり、定期的もしくは緊急に保守要員が機器設置工場に赴いて、保守を行っていた。

#### 【0003】

【発明が解決しようとする課題】しかしながら、近年の半導体生産投資の急増は、生産用機器の設置数の伸びに對して保守要員が慢性的に不足した状況を作り出しつつある。また、生産体制の世界的な広がりによって、より低コストな地域を目指して生産拠点が国内、海外各所の遠隔地に点在している。このような状況変化によって、従来に比べてトラブル対応や定期保守に対して迅速な対応が困難になりつつあり、これをいかに解決するかが大きな課題となっている。また、生産拠点の拡散に伴つて、保守情報が各生産拠点にとどまって生産拠点を超えた情報の共有化が希薄になり、過去のトラブルの経験が生かしにくいという課題もある。

【0004】本発明はこのような課題に鑑みてなされたもので、遠隔地に設置された機器であっても地域を問わず迅速且つ確実な保守を可能とする産業用機器の遠隔保守システムを提供することを目的とする。また、該システムを利用した優れた生産方法を提供することを目的とする。

#### 【0005】

【課題を解決するための手段】上記課題を解決する本発明の好ましい形態は、遠隔地の産業用機器を保守する遠隔保守システムであって、1又は複数の産業用機器の稼動状態を監視する監視手段と、インターネットを介して前記監視手段との間で産業用機器の保守に関する情報を通信しながら産業用機器の保守を管理する管理手段と、を備えることを特徴とする遠隔保守システムである。

【0006】本発明の別の形態は、遠隔地の産業用機器を保守する遠隔保守システムを構成するために、産業用機器側に設けられる監視装置であって、1又は複数の産業用機器のトラブルの発生を検知し、そのトラブルの症状を示すステータス情報を取得する取得手段と、前記取得手段により取得したステータス情報を、インターネットを介して、産業用機器の保守を集中管理する管理装置に通知すると共に、その通知に応答して前記管理装置からインターネットを介して送られてくる応答情報を受信する通信手段と、を備えることを特徴とする遠隔保守システムの監視装置である。

【0007】本発明の別の形態は、遠隔地の産業用機器

を保守する遠隔保守システムを構成するために、ベンダ側に設けられる管理装置であって、1又は複数の産業用機器の稼動状態を監視する監視装置が設置された1又は複数の工場の各監視手段とインターネットを介して通信する通信手段と、前記通信手段により前記監視装置から受信した産業用機器のトラブルの症状に関するステータス情報に基づいて、そのトラブルに対する対処法を決定し、その決定した対処法に基づく応答情報を前記通信手段により該当する監視装置に通知する対応手段と、を備えることを特徴とする遠隔保守システムの管理装置である。

【0008】本発明の別の形態は、遠隔地の産業用機器を保守する遠隔保守方法であって、第1の産業用機器を供給する第1のベンダーと、第2の産業用機器を供給する第2のベンダーと、第1及び第2の産業用機器が設置された第1の工場と、第1及び第2の産業用機器が設置された第2の工場の、それぞれの間でインターネットを介して保守情報を通信し、第1のベンダーは第1及び第2の工場にそれぞれ設置された第1の産業用機器の保守を集中管理し、第2のベンダーは第1及び第2の工場にそれぞれ設置された第2の産業用機器の保守を集中管理することを特徴とする遠隔保守方法である。

【0009】そして、この遠隔保守システムを利用して半導体デバイスを生産する方法や、該方法で生産されたことを特徴とするデバイスも本発明の範疇に含まれる。

【0010】

【発明の実施の形態】以下、図面を用いて本発明の実施の形態を説明する。

【0011】<産業用機器の遠隔保守システムの第1の実施の形態>図1は、本発明の好適な実施の形態に係る産業用機器の遠隔保守システムの概要を示す図である。101は、産業用機器を提供するベンダ（装置供給メーカー）の事業所である。この実施の形態は、産業用機器として、半導体製造工場で使用する半導体製造装置、例えば、前工程用機器（露光装置、塗布現像装置、熱処理装置等）や後工程用機器（組み立て装置、検査装置等）を想定している。

【0012】102～104は、産業用機器のユーザーとしての半導体製造メーカーの生産工場である。生産工場102～104は、互いに異なるメーカーに属する工場であっても良いし、同一のメーカーに属する工場（例えば、前工程用の工場、後工程用の工場等）であっても良い。

【0013】各工場102～104には、夫々、複数の産業用機器106と、それらを結ぶLAN（インターネット）109と、各産業用機器106の稼動状況を監視する監視装置としてのホストコンピュータ107とが設けられている。

【0014】各工場102～104に設けられたホストコンピュータ107は、世界的な規模で広がった通信手段であるインターネット105を介してベンダ101側

の管理装置であるホストコンピュータ108に接続されている。ホストコンピュータ107は、このインターネット105を介して、各産業用機器106の稼動状況を示すステータス情報（例えば、トラブルが発生した産業用機器の症状）を工場側からベンダ側に通知する他、その通知に対応する応答情報（例えば、トラブルに対する対処方法を指示する情報、対処用のプログラムやデータ）をベンダ側から受け取ることができる。なお、以下では、ステータス情報及び／又は応答情報を保守情報という。

【0015】各工場102～104とベンダ101との間の通信および各工場内のLANでの通信には、インターネットで一般的に使用されているパケット通信プロトコル（TCP/IP）が使用される。

【0016】ベンダ101側のホストコンピュータ108は、インターネット105を介して、ユーザの各工場102～104における産業用機器106の稼動状況を時々刻々把握することができる。また、これらの稼動状況や保守の状況などを示す保守情報は、ベンダ101の各部門、例えば、保守部門の他、製造部門、開発部門のコンピュータ110からも参照可能であり、これにより保守情報を製造、開発部門へフィードバックすることができる。

【0017】図2は、各工場に設置されたホストコンピュータ107の動作を示すフローチャートである。ホストコンピュータ107は、このフローチャートに示す処理を定期的に実行することにより、LAN109を介して接続された複数（n）台の産業用機器106の稼動状況を定期的に監視する。そして、トラブルが発生している場合には、ホストコンピュータ107は、トラブルの症状その他のトラブルに関連するステータス情報を取得して、それをインターネット105を介してベンダ101側に通知する。

【0018】図2のフローチャートに示す例では、ホストコンピュータ107は、監視対象の複数の産業用機器106を第1～第nの産業用機器として識別し管理する。そして、パラメータiを順次インクリメントしながら（ステップS207、S208）、第iの産業用機器の稼動状況を監視し（ステップS203）、トラブルが発生している場合には、該当する産業用機器から、その稼動状態に関するステータス情報を取得し（ステップS204）、そのステータス情報をインターネット105を介してベンダ101側に報告する（ステップS205）。そして、ステータス情報の報告に応答してベンダ101側から送信されてくる応答情報に基づいて、可能な場合（例えば、ソフトウェアの更新等によりトラブルを解決可能な場合）には、LAN109を介してトラブルに係る産業用機器を自動で保守する（ステップS206）。なお、トラブルの自動保守ができない場合には、例えばディスプレイにその旨のメッセージを表示する。

【0019】各産業用機器106は、ホストコンピュータ107からの要求に応じて、トラブルの発生の有無をホストコンピュータ107に通知し（ステップS203に対応）、更にそのトラブルの内容を特定して、その特定した内容を示すステータス情報（例えば、トラブルの内容を示すエラーコード）をホストコンピュータ107に通知する機能を有する（ステップS204に対応）。

【0020】ステップS205において、ホストコンピュータ107がベンダ101側に通知するステータス情報には、例えば、トラブルが発生した産業用機器の機種、シリアルナンバー、エラーコード、トラブルの発生した時間等が含まれる。このエラーコードとトラブルの内容との対応関係は、例えば、インターネット105を介してベンダ101側のホストコンピュータ108から随時更新することができる。

【0021】なお、トラブルの内容が予め登録されていない場合には、その旨を示すエラーコードをステータス情報に含めれば良い。この場合は、オペレーターがベンダ側に電話、ファクシミリ、電子メール等の手段により詳細な情報を知らせることになる。

【0022】一方、ベンダ101側の管理装置であるホストコンピュータ108は、各工場に設置されたホストコンピュータ107からの通信に対して、例えば24時間体制で待機する。図3は、ベンダ101側のホストコンピュータ108の動作を示すフローチャートである。

【0023】ベンダ101側のホストコンピュータ108は、図3のフローチャートに示す処理を定期的に実行することにより、各工場102～104の産業機器106の稼動状況を監視する。

【0024】先ず、ホストコンピュータ108は、トラブルの報告（ステータス情報の通知）があるか否かを監視し（ステップS302）、報告があった場合には、その報告に係るステータス情報を取得する（ステップS303）。そして、ホストコンピュータ108は、このステータス情報に基づいて、各工場の産業用機器の保守を管理するためのトラブルデータベース（DB）を参照し、当該報告に係る産業用機器に関して、同一の症状が過去に発生したことがあるか否か、すなわち、同一の症状がトラブルデータベース（後述の501）に登録されているか否かを調査する（ステップS304）。

【0025】その結果、登録されている場合（ステップS304において“yes”）には、更に、その症状に対する対処法がトラブルデータベースに登録されているか否かを判断（ステップS306）し、登録されている場合には、その登録された対処法に関する応答情報（例えば、対処法を示すコード情報やメッセージ、対処用のプログラムやデータ等）を、トラブルの報告に係る工場のホストコンピュータ107にインターネット105を介して通知する（ステップS307）。

【0026】応答情報の通知を受けた工場側のホストコ

ンピュータ107は、その応答情報に基づいて、可能な場合には、自動で該当する産業用機器を正常な状態に復帰させ、それが不可能な場合には、例えば、ディスプレイ等に当該産業用機器のオペレーターに対するメッセージを出力する。

【0027】次いで、ホストコンピュータ108は、ベンダ101側の担当者に対して、トラブル発生の事実、トラブルの内容（ステータス情報）、対処法（応答情報）の通知の有無、現在の状態その他の関連する情報を報告する。この報告は、例えば、コンピュータ110のディスプレイに表示すると共に、ベンダ担当者のメールアドレス宛に、ホストコンピュータ108から自動的に報告の電子メールを送信して行なう。

【0028】ここで、ステップS304において、当該トラブルに係る症状と同一の症状がトラブルデータベースに登録されていないと判断した場合には、当該症状をトラブルデータベースに新規に登録した後にステップS308を実行する。

【0029】オペレーターへの報告（ステップS308）が終ると、ホストコンピュータ108は、トラブルデータベースを更新する（ステップS309）。この更新により、例えば、対処法（応答情報）の送信の有無や、トラブルの報告を受けた時間等がトラブルデータベースに登録される。

【0030】図4は、ステップS308で報告を受けた保守部門の担当者が取り得る措置の流れの一例を示す図である。先ず、担当者は、トラブルデータベースを参照して、トラブルの内容を把握し、対処が必要であるか否かを判断する（ステップS402）。そして、対処の必要がない場合（例えば、ステップS307で適正な対処法を該当する工場に通知している場合）には、例えばトラブルの再現に備えてインターネット105を介して該当する産業用機器106の稼動状態を監視する（ステップS404）。

【0031】一方、対処が必要な場合（ステップS403において“No”）には、担当者は、トラブルデータベースに蓄積された情報等を参照して最適な対処方針を選択する（ステップS403）。

【0032】この対処方針としては、先ず、インターネット105を介してオンラインでトラブルを解決することが考えられる（ステップS407）。この一例として、トラブルの原因がソフトウェアの誤りに起因する場合が挙げられる。この場合、該当する産業用機器のメモリ内のパラメータやプログラムをインターネット105及び工場側のホストコンピュータ107を介してオンラインで修正することも可能である。

【0033】他の対処方針としては、電子メール、ファクシミリ、電話等の手段により、工場のオペレーターに対して、トラブルの解決方法を指示することが考えられる（ステップS406）。

【0034】ステップS405及びS406のいずれの方法でも対処不能な重大なトラブルの場合には、工場を訪問して対処することになる（ステップS405）。

【0035】対処が完了したら、担当者は、ホストコンピュータ108又はコンピュータ110を操作することにより、当該トラブルに関する情報に基づいてトラブルデータベースを更新する（ステップS409）。

【0036】次に、ベンダ101側のホストコンピュータ108に備えられたトラブルデータベースに関して説明する。LAN109を介してホストコンピュータ108に接続された各コンピュータ110さらにはインターネットを介して接続された各工場の産業用機器106のコンソールは、専用又は汎用のブラウザソフトを内蔵しており、これにより、例えば図5に一例を示す様な画面のユーザインターフェースを構成している。

【0037】ベンダ又は各工場のオペレータは、図5に一例を示す画面を参照しながら、産業用機器の機種（401）、シリアルナンバー（402）、トラブルの件名（403）、発生日（404）、緊急度（405）、症状（406）、対処法（407）、経過（408）等の情報を入力することができる。なお、前述のように、トラブルデータベースへの情報の入力は、ホストコンピュータ108により自動的に実行される場合もある。

【0038】図5に示す画面に係るブラウザソフトは、ハイバーリンク機能（410～412）を有し、これによりベンダの各部門の要員や工場のオペレータは、例えば、各項目の更に詳細な情報にアクセスしたり、ソフトウェアのライブラリから最新バージョンのソフトウェアを引出したり、工場のオペレータの参考に供する操作ガイド（補助情報）を引出したりすることができる。

【0039】上記のようにベンダ101側の各部門、例えば保守部門、製造部門、開発部門の要員は、LAN109を介してホストコンピュータ108に接続されたコンピュータ110を用いてトラブルデータベースにアクセスすることができる。また、このトラブルデータベースには、外回りの保守要員もインターネット105を介して携帯端末等によりアクセスすることができる。これによって、ベンダの各部門の情報を一元的に管理することができ、各部門において、常に最新の情報を入手することができる。

【0040】また、トラブルデータベースの一部の情報をユーザ（工場）側に開放することにより、ユーザは、過去に蓄積された様々な保守情報をインターネットを介して入手し、自らがトラブルに対して適切な対処を探ることができる。このように、この実施の基体においては、ベンダ及び複数のユーザ間で保守情報を共有化することにより、保守の効率を飛躍的に高めている。

【0041】さらに、この実施の形態では、第三者がインターネットを介してトラブルデータベースをアクセスすることにより機密情報を入手することを禁止するため

の通信セキュリティシステムを備えている。

【0042】すなわち、このシステムでは、ファイアウォールを設けて、パスワードによる認証に加えて、アクセスを許可するコンピュータを予めベンダ101のホストコンピュータ108に登録することにより、登録したコンピュータ以外のコンピュータによるアクセスを禁止している。

【0043】図6は、この実施の形態に係る通信セキュリティシステムの構成を示す図である。ユーザがブラウザ500を用いてベンダ101側のホストコンピュータ108のトラブルデータベース501にアクセスする際の通信は、暗号化されたパケット通信によって行われる。両ホストコンピュータ107、108は、暗号・復号器502、504を及び通信コントローラ503、505を夫々備えている。暗号・復号のアルゴリズムは、各工場（ユーザ）毎に個別に設け（ベンダ側の暗号・復号器は複数のアルゴリズムに対応させる）、更に、この暗号・復号のアルゴリズムを定期的に変更することにより、セキュリティを高めることができる。

【0044】以上のように本実施形態のシステムにおいては、既存のインフラであるインターネット及びその通信プロトコル、さらにはインターネットアクセス用のソフトウェアを活用して産業用機器の保守情報を通信するようにしたので、専用通信ラインの敷設や新たなソフトウェア開発の負担などを軽減し、迅速で低コストな遠隔保守システムの構築を可能としている。

【0045】また、産業用機器を設置した複数の工場と、ベンダーの管理システムとを通信手段で接続して、さまざまな保守情報を集中的に管理して情報を共有化することで、生産拠点を超えて過去のトラブルの経験を生かすことができ、トラブルに対して迅速に対応することができる。特に、異なるユーザー企業間でも保守情報を共有するようにすれば、産業全体の効率化向上にも貢献することができる。

【0046】<産業用機器の遠隔保守システムの第2の実施形態>図7は本発明の第2の実施形態の産業用機器保守システムの概念図である。先の実施形態では、それぞれが産業用機器を備えた複数のユーザー工場と、該産業用機器のベンダーの管理システムとを通信手段で接続して、該通信手段を介して各工場の産業用機器の保守情報を通信するものであったが、本実施形態では、更に加えて複数のベンダーの産業用機器を備えた工場と、該複数の産業用機器のそれぞれのベンダーの管理システムとをインターネットを利用した通信手段で接続して、該通信手段を介して各産業用機器の保守情報を通信するものである。

【0047】図7において、201は産業用機器ユーザー（半導体デバイス製造メーカー）の生産工場であり、工場の生産ラインには半導体デバイス製造用装置である露光装置202、塗布現像装置203、熱処理装置204などが導

入されている。なお図7では生産工場201は1つだけ描いているが、実際は複数の工場が同様にネットワーク化されている。これらの各装置はLAN206(インターネット)で接続され、生産管理用ホストコンピュータ205でラインの稼動管理されている。一方、露光装置メーカー210、塗布現像装置メーカー220、熱処理装置メーカー230などベンダー(装置供給メーカー)の各事業所には、それぞれ供給機器の遠隔保守を行なうためのホスト管理システム211, 221, 231を備えている。そして、ユーザーの生産工場内の各装置を管理するホストコンピュータ205と、各装置のベンダーの管理システム211, 221, 231とは、通信手段であるインターネット200によって接続されている。なお、各ベンダー210, 220, 230では、先の図1の例で説明したように、複数のユーザーの工場内の自分が供給した装置の保守を集中管理している。

【0048】このシステムにおいて、生産ラインの一連の生産機器の中のどれかにトラブルが起きると、生産ラインの稼動が止まってしまうが、トラブルが起きた機器のベンダーからインターネット200を介した遠隔保守を受けることで迅速な対応が可能で、生産ラインの休止を最小限に抑えることができる。各ベンダーのホスト管理システムは上記第1の実施形態で説明したようなトラブルデータベースを備え、保守情報が蓄積されている。また、生産工場と各ベンダーとの通信には異なる通信セキュリティシステムを備え機密の漏洩を防止している。具体的な保守の内容や方法は、第1の実施形態と同様であるので詳しい説明は省略する。

【0049】以上のように本実施形態のシステムにおいては、複数のベンダーの産業用機器を生産ラインに持つ同一又は異なるユーザーの複数の工場と、各ベンダーの管理システムとを通信手段で接続して保守情報を通信するようにしたので、生産中にある機器でトラブルが生じても対応するベンダーから迅速な保守を受けることが可能で、ラインが止まる時間を最小限に抑えて生産効率を高めることができる。特に、異なるユーザー企業同士あるいは異なるベンダー企業同士でも保守情報を共有するようすれば、産業全体の効率化向上にも貢献することができる。

【0050】<半導体デバイス生産方法の実施形態>次に上記説明した遠隔保守システムを利用した設備における半導体デバイスの生産方法の例を説明する。

【0051】図8は微小デバイス(ICSやLSI等の半導体チップ、液晶パネル、CCD、薄膜磁気ヘッド、マイクロマシン等)の製造のフローを示す。ステップ1(回路設計)では半導体デバイスの回路設計を行なう。ステップ2(マスク製作)では設計した回路パターンを形成したマスクを製作する。一方、ステップ3(ウエハ製造)ではシリコン等の材料を用いてウエハを製造する。ステップ4(ウエハプロセス)は前工程と呼ばれ、

上記用意したマスクとウエハを用いて、リソグラフィ技術によってウエハ上に実際の回路を形成する。次のステップ5(組み立て)は後工程と呼ばれ、ステップ4によって作製されたウエハを用いて半導体チップ化する工程であり、アッセンブリ工程(ダイシング、ボンディング)、パッケージング工程(チップ封入)等の工程を含む。ステップ6(検査)ではステップ5で作製された半導体デバイスの動作確認テスト、耐久性テスト等の検査を行なう。こうした工程を経て半導体デバイスが完成し、これを出荷(ステップ7)する。前工程と後工程はそれぞれ専用の別の工場で行い、これらの工場毎に上記説明した遠隔保守システムによって保守がなされる。

【0052】図9は上記ウエハプロセスの詳細なフローを示す。ステップ11(酸化)ではウエハの表面を酸化させる。ステップ12(CVD)ではウエハ表面に絶縁膜を形成する。ステップ13(電極形成)ではウエハ上に電極を蒸着によって形成する。ステップ14(イオン打込み)ではウエハにイオンを打ち込む。ステップ15(レジスト処理)ではウエハに感光剤を塗布する。ステップ16(露光)では露光装置によってマスクの回路パターンをウエハに焼付露光する。ステップ17(現像)では露光したウエハを現像する。ステップ18(エッチング)では現像したレジスト像以外の部分を削り取る。ステップ19(レジスト剥離)ではエッチングが済んで不要となったレジストを取り除く。これらのステップを繰り返し行なうことによって、ウエハ上に多重に回路パターンを形成する。各工程で使用する生産機器は上記説明した遠隔保守システムによって保守がなされているので、トラブルを未然に防ぐと共に、もしトラブルが発生しても迅速な復旧が可能で、従来に比べて半導体デバイスの生産性を向上させることができる。

【0053】

【発明の効果】以上本発明によれば、産業用機器の遠隔保守の通信手段として、世界的に網羅されたインターネットを利用することにより、機器の設置地域を問わずに少ない投資で有効な保守システムを構築することが可能となる。

【0054】また、産業用機器を設置したユーザー工場と、ベンダーの管理システムとを通信手段で接続して遠隔保守を行なうことで、トラブルに対して迅速に対応することができ、保守情報の共有化によって保守能力の向上も期待できる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態に係る産業用機器の遠隔保守システムの概要を示す図である。

【図2】ユーザー(工場)側に設置された監視装置としてのホストコンピュータの動作を示すフローチャートである。

【図3】ベンダー側に設置された管理装置としてのホストコンピュータの動作を示す図である。

【図4】保守部門の担当者が取り得る措置の一例を示す図である。

【図5】トラブルデータベースのユーザインターフェースである入力画像の一例を示す図である。

【図6】通信セキュリティシステムの構成を示す図である。

【図7】本発明の第2の実施の形態に係る産業用機器の遠隔保守システムの概要を示す図である。

【図8】半導体デバイスの製造フローを示す図である。

【図9】ウェハプロセスを示す図である。

【符号の説明】

101 ベンダーの事業所

102~104 ユーザーの生産工場

105 インターネット

106 産業用機器

107 各工場(ユーザー)のホストコンピュータ

108 ベンダーのホストコンピュータ

109 LAN

110 ベンダーの各部門のコンピュータ

200 インターネット

201 ユーザーの生産工場

202 露光装置

203 塗布現像装置

204 热処理装置

205 生産管理用ホストコンピュータ

206 LAN

210 露光装置メーカー事業所

211 ホスト管理システム

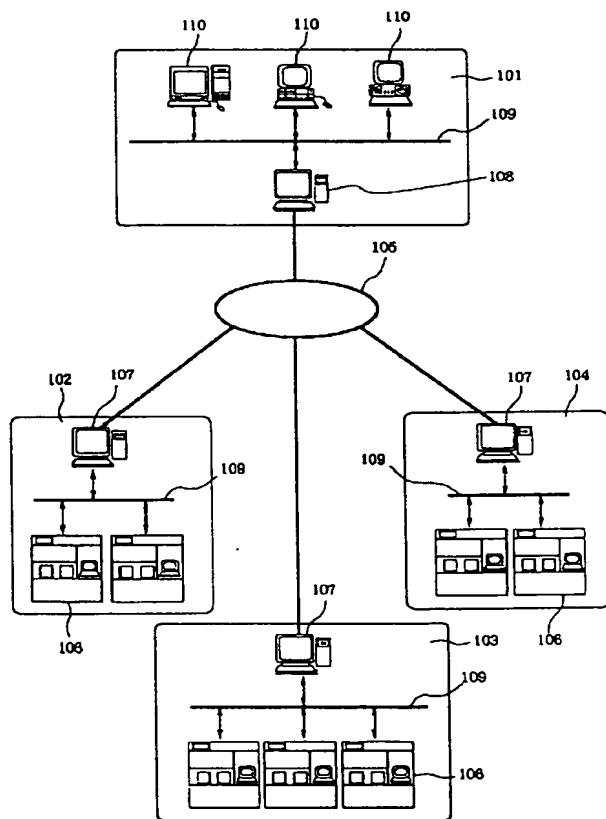
220 塗布現像装置メーカーの事業所

221 ホスト管理システム

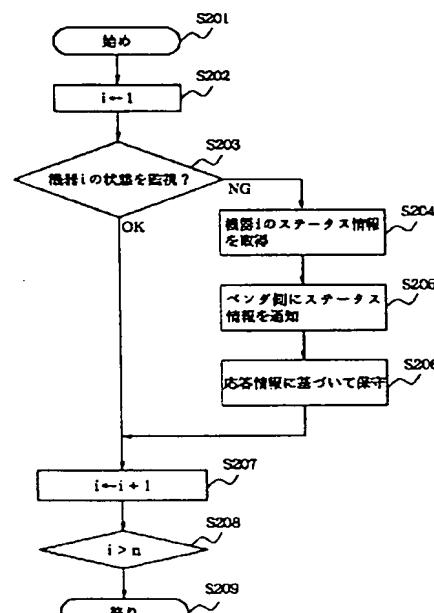
230 热処理装置メーカーの事業所

231 ホスト管理システム

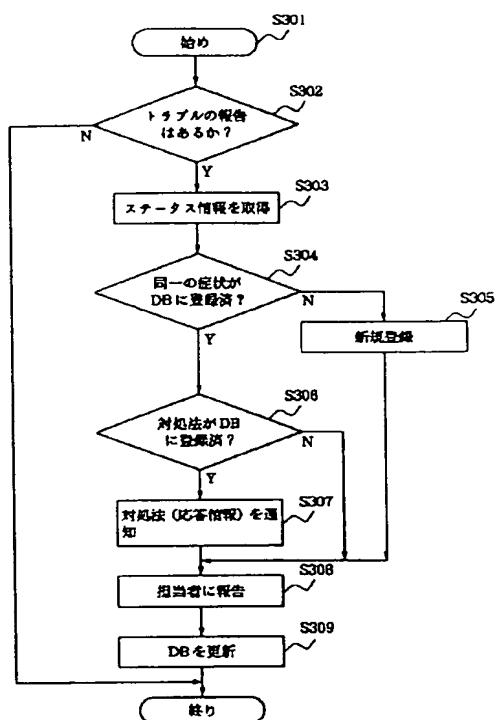
【図1】



【図2】



【図3】



【図5】

URL <http://www.maintain.co.jp/db/input.html>

トラブルDB入力画面

入力

梱包番号: 401  
件名: 電源不良(立ち停エラー) 403  
梱包S/N: 465N34560001 402  
梱包段: 0 405

症状: 電源投入後LCDが点滅し続ける 406

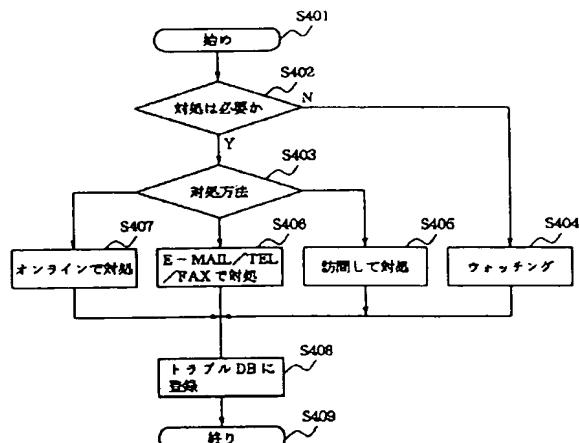
対処法: 電源再投入(正面側に赤ボタンを押下) 407

備考: 密封対応品 408

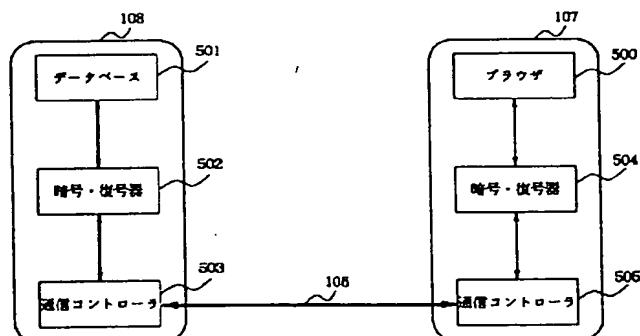
戻る 410 リセット 411 ソフトウェアライブリ 412 指定ガイド

結果一覧データベースへリンク

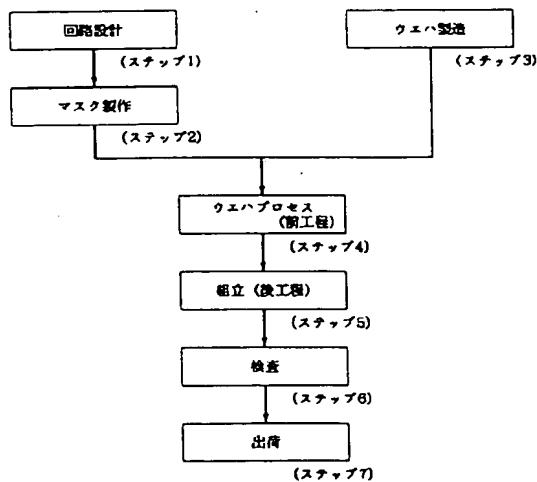
【図4】



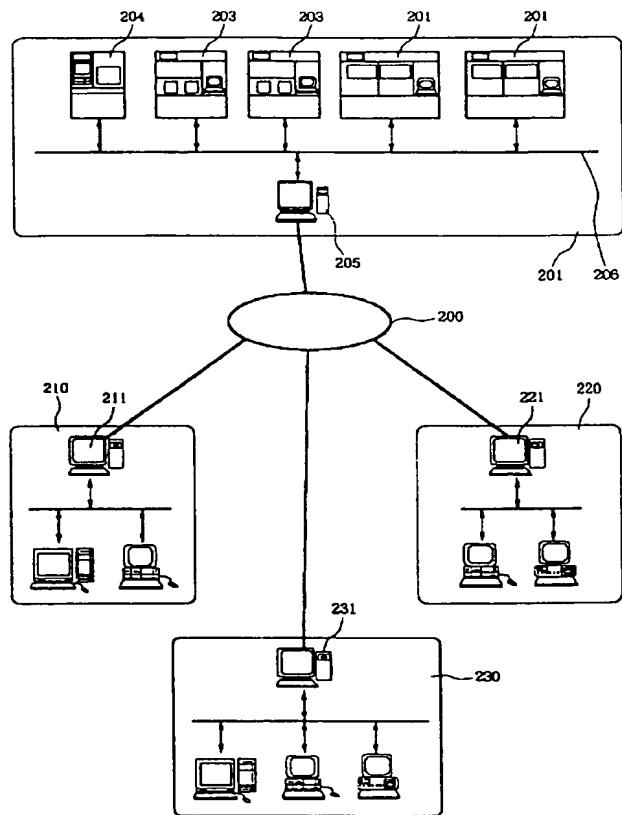
【図6】



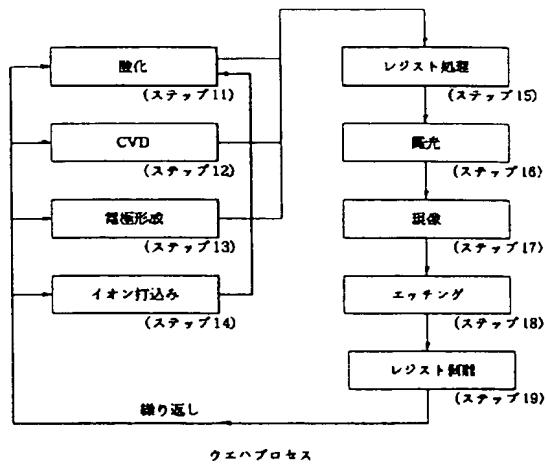
【図8】



【図7】



【図9】



フロントページの続き

(72)発明者 太田 裕久  
東京都大田区下丸子3丁目30番2号キヤノ  
ン株式会社内